A FIELD GUIDE TO FOREST SITE IDENTIFICATION AND INTERPRETATION FOR THE CARIBOO FOREST REGION

O. A. Steen and R. A. Coupé

Ministry of Forests
Research Program

1997

106-06315/

AUTHORS AND AFFILIATIONS

Ordell Steen, Research Ecologist, Cariboo Forest Region, Ministry of Forests, 200 - 640 Borland Street, Williams Lake, B.C. V2G 4T1

Ray Coupé, Research Ecologist, Cariboo Forest Region, Ministry of Forests, 200 - 640 Borland Street, Williams Lake, B.C. V2G 4T1

Canadian Cataloguing in Publications Data
Steen, O. A.
A field guide to forest site identification and interpretation for the Cariboo Forest Region

Includes bibliographical references: p.
ISBN 0-7726-3495-5

1. Bioclimatology – British Columbia – Cariboo Region. 2. Forest site quality – British Columbia – Cariboo Region. 3. Biogeography – British Columbia – Cariboo Region. 4. Forest ecology – British Columbia – Cariboo Region. 5. Forest management – British Columbia – Cariboo Region. 6. Cariboo Forest Region (B. C.). I. Coupé, R., 1952- . II. British Columbia. Ministry of Forests. Research Branch.

QH541.5.F6S73 1998 581.7'37'09711 C98–960063–7

© 1997 Province of British Columbia
Published by the Research Branch, Ministry of Forests, 712 Yates Street, Victoria, B. C. V8W 3E7

Citation:
Steen, O.A and R.A. Coupé. 1997. A field guide to forest site identification and interpretation for the Cariboo Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 39.

Copies of this and other Ministry of Forests titles are available from Crown Publications Inc., 521 Fort Street, Victoria, B.C. V8W 1E7

ACKNOWLEDGEMENTS

The classification and interpretations presented in this field guide have evolved over the past 20 years through the collective work of several individuals involved in the many phases of the Cariboo Forest Region ecological classification project.

W.J. Watt coordinated the ecological classification project in the Cariboo Forest Region from 1977 to 1983. During this time and in subsequent years, he provided important guidance on observation and interpretation of site and soil attributes. Several individuals summarized and interpreted data and developed preliminary ecological classifications and draft ecosystem guides: R. Annas, C. Bowling, B. Coupé, R. Dawson, K. Iverson, L. Lemmen, I. Leung, S. Mah, K. Mayes, P. McAuliffe, R. Meister, N. Stromberg, A. vonSaken, M. Waterhouse, and A. Yee. A. Yee contributed very significantly towards the development of initial approaches to ecological classification and description in the Cariboo Forest Region. In addition to these individuals, many others collected field data from the more than 3000 plots that form the basis of the classification in this guide. A. Roberts, F. Boas, and W. Noble identified difficult vascular, bryophyte, and lichen specimens.

This field guide is based on the provincially correlated ecological classification made possible by the Ministry of Forests Ecological Classification Correlation Program. D. Meidinger directed this correlation effort and worked closely with all forest regions in the provincial synthesis of ecological classification data. We have benefited from his enthusiasm, technical insights, and supportive role. T. Fleming, S. Mah, C. Cadrin, A. Inselberg, and K. Yearsley provided data analyses and interpretations for the provincial correlation project. D. Lloyd, C. DeLong, F. Nuszdorfer, A. Banner, and others helped to resolve correlation and mapping issues between the Cariboo and other forest regions.

The format and content of this guide have benefited greatly from guides to ecosystems for other forest regions in British Columbia. Many of the site and soil description aids in the appendices have been adapted from these other regional guides. The text of sections 1–3 has been modified from text prepared by T. Braumandl, R. Green, C. DeLong, A. Banner, and D. Meidinger.

Forest health information in Section 7 was provided by L. Rankin. An initial draft of the silviculture considerations tables was modified and further developed with input from several experienced silviculturists in the Cariboo Forest Region. We thank A. Randall, K. Day, P. Hendrix, C. Gibson-Robertson, M. Seilis, D. Harris, D. Greeley, G. White, A. Lacourcier, T. Harding, C. von Hahn, W. Nuyens, K. Peel, G. McIntosh, M. Rungi, N. Daintith, T. Newsome, and the others who contributed to this section.

D. Meidinger made many valuable review comments and suggestions for all sections of the guide. Other valuable review comments were provided by A. MacKinnon, A. Banner, T. Braumandl, E. Hamilton, J. McClarnon, N. Daintith, T. Newsome, and P. Nystedt.

We thank B. Hammerstron of Image House Inc. in Williams Lake for his creativity and very important role in the technical production aspects of this guide.

P. Nystedt and others of the Production Resources Group of the Ministry of Forests Research Branch provided very important assistance in developing the presentation format of this guide and facilitating many aspects of its final production. S. Smith did the English edit.

Plant illustrations by the following artists have been used in the guide: F.L. Beebe, G. Bishop, T.C. Brayshaw, M. Bryant, P. Drukker-Brammall, P. Frank, G.F. Harcombe, A. Hassen, S. Mitchell, B.C. Newton, S.D. Salkeld, E.J. Stephen, and R.A. With. We thank the Royal British Columbia Museum and the British Columbia Ministry of Environment, Lands and Parks for permission to use plant illustrations from their publications.

To all others who provided advice or logistical support in the many phases of this project we extend our thanks.

TABLE OF CONTENTS

AUTHORS AND AFFILIATIONS ii

ACKNOWLEDGEMENTS iii

PART 1

1 INTRODUCTION 1 - 1

Objectives and Scope 1 - 1
Other Sources of Information 1 - 2
Guide Contents and Limitations 1 - 3
Format of the Guide 1 - 4
Training 1 - 4

2 BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION SYSTEM 2 - 1

Ecosystems 2 - 1
Synopsis of BEC System 2 - 1
Vegetation Classification 2 - 2
Climatic (Zonal) Classification 2 - 2
Site Classification 2 - 6
Seral Classification 2 - 8

3 PROCEDURES FOR SITE DESCRIPTION AND IDENTIFICATION 3 - 1

Identifying Biogeoclimatic Units 3 - 2
Describing and Identifying Site Units 3 - 3

4 ENVIRONMENT OF THE CARIBOO FOREST REGION 4 - 1

Physiography 4 - 1
Climate 4 - 4
Vegetation and Soils 4 - 6

5 BIOGEOCLIMATIC UNITS OF THE CARIBOO FOREST REGION 5•1 - 1
Introduction 5•1 - 1

AT - Alpine Tundra Zone ... 5•2 - 1
BG - Bunchgrass Zone ... 5•3 - 1
CWH - Coastal Western Hemlock Zone ... 5•4 - 1
ESSF - Engelmann Spruce–Subalpine Fir Zone ... 5•5 - 1
ICH - Interior Cedar–Hemlock Zone ... 5•6 - 1
IDF - Interior Douglas-fir Zone ... 5•7 - 1
MS - Montane Spruce Zone ... 5•8 - 1
MH - Mountain Hemlock Zone ... 5•9 - 1
SBPS - Sub-Boreal Pine–Spruce Zone ... 5•10 - 1
SBS - Sub-Boreal Spruce Zone ... 5•11 - 1

6 SITE UNITS OF THE CARIBOO FOREST REGION .. 6•1 - 1

Guide to Site Unit Descriptions ... 6•1 - 1
AT - Alpine Tundra Zone ... 6•2 - 1
BGxh3 - BG Very Dry Hot Subzone, Fraser Variant ... 6•3 - 1
BGxw2 - BG Very Dry Warm Subzone, Alkali Variant ... 6•4 - 1
CWH - Coastal Western Hemlock Zone ... 6•5 - 1
ESSFdc2 - ESSF Dry Cold Subzone, Thompson Variant ... 6•6 - 1
ESSFmv1 - ESSF Moist Very Cold Subzone, Nechako Variant ... 6•7 - 1
ESSFwc3 - ESSF Wet Cold Subzone, Cariboo Variant ... 6•8 - 1
ESSFwk1 - ESSF Wet Cool Subzone, Cariboo Variant ... 6•9 - 1
ESSFxc - ESSF Very Dry Cold Subzone ... 6•10 - 1
ESSFxv1 - ESSF Very Dry Very Cold Subzone, West Chilcotin Variant ... 6•11 - 1
ESSFxv2 - ESSF Very Dry Very Cold Subzone, Big Creek Variant ... 6•12 - 1
ICHdk - ICH Dry Cool Subzone ... 6•13 - 1
ICHmk3 - ICH Moist Cool Subzone, Horsefly Variant ... 6•14 - 1
ICHmw3 - ICH Moist Warm Subzone, Thompson Variant 6•15 - 1
ICHwk2 - ICH Wet Cool Subzone, Quesnel Variant ... 6•16 - 1
ICHwk4 - ICH Wet Cool Subzone, Cariboo Variant ... 6•17 - 1
IDFdk1 - IDF Dry Cool Subzone, Thompson Variant ... 6•18 - 1
IDFdk3 - IDF Dry Cool Subzone, Fraser Variant ... 6•19 - 1
IDFdk4 - IDF Dry Cool Subzone, Chilcotin Variant ... 6•20 - 1
IDFdw - IDF Dry Warm Subzone ... 6•21 - 1
IDFmw2 - IDF Moist Warm Subzone, Thompson Variant 6•22 - 1
IDFxm - IDF Very Dry Mild Subzone ... 6•23 - 1
IDFxw - IDF Very Dry Warm Subzone. ... 6•24 - 1

MHmm2 - MH Moist Maritime Subzone,
Leeward Variant .... 6•25 - 1
MSdc2 - MS Dry Cold Subzone, Tatlayoko Variant .... 6•26 - 1
MSdv - MS Dry Very Cold Subzone .... 6•27 - 1
MSxk - MS Very Dry Cool Subzone .... 6•28 - 1
MSxv - MS Very Dry Very Cold Subzone .... 6•29 - 1
SBPSdc - SBPS Dry Cold Subzone .... 6•30 - 1
SBPSmc - SBPS Moist Cold Subzone .... 6•31 - 1
SBPSmk - SBPS Moist Cool Subzone .... 6•32 - 1
SBPSxc - SBPS Very Dry Cold Subzone .... 6•33 - 1

PART 2

SBSdw1 - SBS Dry Warm Subzone, Horsefly Variant .... 6•34 - 1
SBSdw2 - SBS Dry Warm Subzone, Blackwater Variant .... 6•35 - 1
SBSmc1 - SBS Moist Cold Subzone, Moffat Variant .... 6•36 - 1
SBSmc2 - SBS Moist Cold Subzone, Babine Variant .... 6•37 - 1
SBSmh - SBS Moist Hot Subzone .... 6•38 - 1
SBSmm - SBS Moist Mild Subzone .... 6•39 - 1
SBSmw - SBS Moist Warm Subzone .... 6•40 - 1
SBSwk1 - SBS Wet Cool Subzone, Willow Variant .... 6•41 - 1

7 SILVICULTURE CONSIDERATIONS[1] .... 7•1 - 1

Background. .... 7•1 - 1
ESSFwc3 - ESSF Wet Cold Subzone, Cariboo Variant .... 7•8 - 1
ESSFwk1 - ESSF Wet Cool Subzone, Cariboo Variant .... 7•9 - 1
ESSFxv1 - ESSF Very Dry Very Cold Subzone,
West Chilcotin Variant .... 7•11 - 1
ICHdk - ICH Dry Cool Subzone .... 7•13 - 1
ICHmk3 - ICH Moist Cool Subzone, Horsefly Variant .... 7•14 - 1
ICHwk2 - ICH Wet Cool Subzone, Quesnel Variant .... 7•16 - 1
ICHwk4 - ICH Wet Cool Subzone, Cariboo Variant .... 7•17 - 1
IDFdk3 - IDF Dry Cool Subzone, Fraser Variant .... 7•19 - 1
IDFdk4 - IDF Dry Cool Subzone, Chilcotin Variant .... 7•20 - 1
IDFxm - IDF Very Dry Mild Subzone .... 7•23 - 1
IDFxw - IDF Very Dry Warm Subzone .... 7•24 - 1
MSxv - MS Very Dry Very Cold Subzone .... 7•29 - 1

---

[1] Subsection numbers are the same as for the equivalent biogeoclimatic unit in Section 6. Missing subsections indicate biogeoclimatic units for which silviculture considerations have not yet been prepared.

SBPSdc - SBPS Dry Cold Subzone .... 7•30 - 1
SBPSmk - SBPS Moist Cool Subzone .... 7•32 - 1
SBPSxc - SBPS Very Dry Cold Subzone .... 7•33 - 1
SBSdw1 - SBS Dry Warm Subzone, Horsefly Variant .... 7•34 - 1
SBSdw2 - SBS Dry Warm Subzone, Blackwater Variant ... 7•35 - 1
SBSmc1 - SBS Moist Cold Subzone, Moffat Variant .... 7•36 - 1
SBSmc2 - SBS Moist Cold Subzone, Babine Variant .... 7•37 - 1
SBSmh - SBS Moist Hot Subzone .... 7•38 - 1
SBSmw - SBS Moist Warm Subzone .... 7•40 - 1
SBSwk1 - SBS Wet Cool Subzone, Willow Variant .... 7•41 - 1

8 **LITERATURE CITED** .... 8 - 1

APPENDICES

1 Equivalence of current provincially correlated BEC codes and the pre-correlation classification codes for ecosystems in the Cariboo Forest Region .... A•1 - 1
2 Tree species codes and symbols .... A•2 - 1
3 Ecoregion classification of the Cariboo Forest Region .... A•3 - 1
4 Relative soil moisture regime identification key .... A•4 - 1
5 Actual soil moisture regime relationship to relative soil moisture regime and biogeoclimatic unit .... A•5 - 1
6 Soil nutrient regime identification .... A•6 - 1
7 Guide to identification of surficial geological materials .... A•7 - 1
8 Guide to the common rock types of the Cariboo Forest Region .... A•8 - 1
9 Guide to field soil texturing .... A•9 - 1
10 Soil particle size classification .... A•10 - 1
11 Guide to the identification of soil orders and great groups .... A•11 - 1
12 Characteristics of humus form orders .... A•12 - 1
13 Common and scientific names of plant species mentioned in this guide .... A•13 - 1
14 Comparison charts for visual estimation of foliage cover .... A•14 - 1
15 Description of vegetation subcomplexes listed in silviculture considerations tables .... A•15 - 1

TABLES

1 Subzone name codes ... 2 - 5
2 Important site and soil features for identifying site units ... 3 - 4
3 Environmental characteristics of BG subzones in the Cariboo Forest Region ... 5•3 - 2
4 Environmental characteristics of ESSF subzones and variants in the Cariboo Forest Region ... 5•5 - 2
5 ESSF vegetation table - zonal sites ... 5•5 - 6
6 Environmental characteristics of ICH subzones and variants in the Cariboo Forest Region ... 5•6 - 2
7 ICH vegetation table - zonal sites ... 5•6 - 6
8 Environmental characteristics of IDF subzones and variants in the Cariboo Forest Region ... 5•7 - 2
9 IDF vegetation table - zonal sites ... 5•7 - 5
10 Environmental characteristics of MS subzones and variants in the Cariboo Forest Region ... 5•8 - 2
11 MS vegetation table - zonal sites ... 5•8 - 5
12 Environmental characteristics of SBPS subzones in the Cariboo Forest Region ... 5•10 - 3
13 SBPS vegetation table - zonal sites ... 5•10 - 6
14 Environmental characteristics of SBS subzones and variants in the Cariboo Forest Region ... 5•11 - 2
15 SBS vegetation table - zonal sites ... 5•11 - 6
16 Vegetation potential classes ... 7•1 - 13

FIGURES

1 Location of the Cariboo Forest Region ... 1 - 1
2 Mesoslope position diagram ... 3 - 5
3 Physiographic subdivisions of the Cariboo Forest Region ... 4 - 2
4 Example silviculture considerations table ... 7•1 - 8

1 INTRODUCTION

Objectives and Scope

This guide presents site identification and interpretation information for forest ecosystems of the Cariboo Forest Region. Site identification is based on the biogeoclimatic ecosystem classification (BEC) initially developed by V.J. Krajina and his students at the University of British Columbia and subsequently revised by the B.C. Ministry of Forests.

The objectives of the classification are:

- to provide a framework for organizing ecological information and management experience about ecosystems;
- to promote a better understanding of forest ecosystems and their interrelationships;
- to provide resource managers with a common "language" to describe forest sites; and
- to improve the user's ability to prescribe and monitor site-specific treatments.

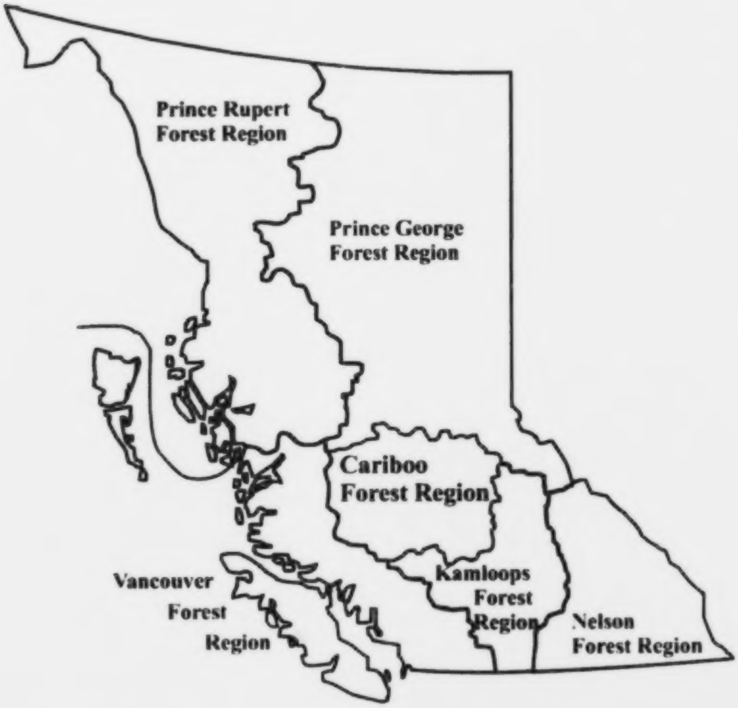

Prince Rupert Forest Region
Prince George Forest Region
Cariboo Forest Region
Vancouver Forest Region
Kamloops Forest Region
Nelson Forest Region

FIGURE 1 Location of the Cariboo Forest Region.

This guide results from the recently completed provincial correlation of the BEC system. It replaces "A Field Guide for the Identification and Interpretation of Ecosystems of the Cariboo Forest Region" (Research Section, Cariboo Forest Region 1982). Correlations between classification units used in this guide and those used in the previous guide for the Cariboo Forest Region are presented in Appendix 1.

This guide has two principal goals:

- to assist users in describing and identifying forest ecosystems; and
- to provide management interpretations to assist users in preparing stand-level forest management prescriptions.

This guide describes only forested site units. Grassland, non-forested wetland, alpine tundra, and other non-forested sites of the Cariboo Forest Region will be described separately in other guides. In addition, the ecosystem descriptions apply primarily to coniferous forests, since deciduous forests have not been sufficiently well studied to be included.

Other Sources of Information

This guide is to be used in conjunction with the map of "Biogeoclimatic Units of the Cariboo Forest Region" available from the Research Section, Cariboo Forest Region in Williams Lake. More complete descriptions of the BEC system can be found in Pojar *et al.* (1987), MacKinnon *et al.* (1992), and Meidinger and Pojar (1991). For a more detailed discussion of ecosystem description methods, refer to Luttmerding *et al.* (1990). References for the identification of most of the common plants in the Cariboo Forest Region are MacKinnon *et al.* (1992) for northern parts of the Region and Parish *et al.* (1996) for southern parts of the Region. Other sources of information on silviculture systems and practices are included in Section 7.1.

Guide Contents and Limitations

This guide consists of seven principal sections plus appendices. Section 2 provides an overview of the BEC system. Section 3 outlines procedures for describing forest sites and identifying biogeoclimatic and site units. It is basically a "how-to" section. Section 4 provides a brief overview of the environment of the Cariboo Forest Region including physiography and major climate patterns. Section 5 describes the biogeoclimatic units (zones, subzones, and variants) of the Cariboo Forest Region including their distinguishing features. Section 6 describes the forested site units of each biogeoclimatic unit for which a site classification has been completed. It includes keys to site unit identification, edatopic grids, and vegetation and environment summaries. Section 7 summarizes silviculture considerations for site units. It includes ecologically adapted tree species, principal site factors limiting forest regeneration, shrub and herbaceous vegetation potential, and a summary of principles and current experience regarding successful silviculture practices. The appendices include several tools to aid site description and identification, including guides to identification of soil moisture regime, soil nutrient regime, soil texture class, common rock types, and soil humus form.

In this guide we have synthesized the knowledge and experience gained during nearly 20 years of forest ecosystem sampling, monitoring of management practices, and research in the Cariboo Forest Region.

Some biogeoclimatic units have not been sufficiently well sampled to develop a forest site classification. These occur mostly in the Coast Mountains where there has been relatively little timber harvesting history.

No guide to ecosystems can encompass all of the complexity and diversity of forest ecosystems that occur on the landscape. Although the described site units include most of the common ecosystems found throughout the distribution of the biogeoclimatic units, users are certain to encounter sites that do not appear to "fit" any site unit description. In these cases, a description of the site, soils, and vegetation features of the site and an understanding of the effects of these features on management options can assist in formulating an ecologically sound management prescription. It is important to recognize that the intent of this guide is to provide information to help users to classify sites and develop management prescriptions.

Format of the Guide

This guide has been structured and paginated to readily allow updates of individual sections and to allow users to modify the guide to suit their specific needs. Each section or subsection has its own numbering sequence and all pages have headers on the upper left and right indicating the section topic. Each biogeoclimatic unit has the same subsection number in sections 6 and 7.

Training

We have assumed that users of this guide have completed a BEC training course offered by a Ministry of Forests Regional Research Section, in which basic concepts and methods of ecosystem description and assessment are introduced. For information on training courses, contact the Research Manager, Cariboo Forest Region.

2 BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION (BEC) SYSTEM

This section briefly describes the principal concepts of the biogeoclimatic ecosystem classification (BEC) system. For a more complete description of the BEC system, refer to Pojar *et al.* (1987) or Pojar and Meidinger (1991).

Ecosystems

The BEC system classifies and organizes information about ecosystems. Ecosystems are interacting complexes of living organisms and their physical/chemical environment. For purposes of the BEC system, ecosystems are defined as portions of the physical landscape and the living systems that are on and in it. Complex interactions occur among the organisms within an ecosystem as well as between the organisms and their physical/chemical environment. In practical application, an ecosystem in the BEC system is identified and characterized by a plant community and its associated topography, soil, and climate. That is, it is an area of relatively uniform vegetation on relatively uniform topography and soils. Although other living organisms and other physical/chemical components of the ecosystem are not explicitly used to identify the ecosystem, it is assumed that they are relatively uniform within an area of uniform vegetation, topography, and soils.

Boundaries between ecosystems may be abrupt but more commonly are gradual due to the gradual change in physical and biological features across the landscape. As a result, most ecosystems include some variation in biological and physical features.

Synopsis of BEC system

The BEC system groups ecosystems at three levels of integration: regional, local, and chronological. At the regional level, vegetation, soils, and topography are used to infer the regional climate and to identify geographic areas that have relatively uniform climate. These geographic areas are termed biogeoclimatic units. At the local level, segments of the landscape are classified into site units that have relatively uniform vegetation, soils, and topography. Several site units are distributed within each biogeoclimatic unit, according to differences in topography.

soils, and vegetation. At the chronological level of integration, ecosystems are classified and organized according to their successional relationships on a particular site.

To arrive at the three levels of integration, the BEC system integrates four classifications: vegetation, climatic (zonal), site, and seral. Vegetation classification is the most important step in the development of the ecosystem classification. However, the climatic and site classifications are the principal classifications used in application of the BEC system.

Vegetation Classification

The vegetation classification groups floristically similar plant communities into vegetation units using an approach similar to that of Braun-Blanquet (see Mueller-Dombois and Ellenberg 1974; Pojar *et al.* 1987). The principal vegetation unit is the plant association. Since late seral or climax vegetation is considered to be the best integrator of the combined influence of the many environmental factors affecting the ecosystem, and since it is a readily visible and measurable feature, the vegetation classification is integral to development of the other classifications. It is used to develop the site, climatic, and seral classifications, although it is generally not used in the field to identify climatic or site units. That is, the vegetation classification is used to develop the site classification, but once the site classification is developed, the site units are identified by a combination of site features and vegetation.

Climatic (Zonal) Classification

Concepts

The climatic or zonal classification uses vegetation, soils, and topography to infer the regional climate of a geographic area. It identifies areas (termed biogeoclimatic units) that have a relatively uniform climate (inferred from vegetation, soils, and topography), and classifies these areas in terms of their inferred climate. As used here, climate refers to the regional climate that influences ecosystems over an extended period of time and is usually expressed as statistics derived from normals of precipitation and temperature.

The geographic extent of biogeoclimatic units (areas of relatively uniform climate) in the BEC system is inferred from the distribution of climax and late-seral plant communities on zonal sites. Zonal sites are those where the influence of the prevailing climate on the vegetation is believed to be least modified by the local topography or the physical/chemical properties of the soil. They have intermediate soil moisture and nutrient regimes and the following additional characteristics:

- slope position mid in mountainous terrain and mid to upper in subdued terrain;
- slope position, gradient, aspect, and location do not result in strong modification of the climate (e.g., frost pockets, steep south or north aspects, snowdrift areas);
- slope gradients gentle to moderate (5–30%); generally 5–15% in dry climates but may be up to 50% in wet climates;
- soils have a) moderately deep to deep (>50 cm) rooting zone, without a strongly restricting horizon, b) loamy texture with coarse fragment content <50% by volume, and c) free drainage.

Other ecosystems (edaphic and topoedaphic ecosystems) within a regional climate are influenced more strongly by local topography and physical and chemical properties of soil parent materials. Therefore they do not provide as clear a reflection of the regional climate. For example, wet toe slopes and depressions have similar vegetation in different climates.

Biogeoclimatic subzones are the basic unit of the climatic classification. Subzones are grouped into biogeoclimatic zones to create more generalized units, and subdivided into biogeoclimatic variants to create more specific or climatically homogeneous units.

Biogeoclimatic subzones are sequences of related ecosystems that are distributed within a geographic area of vegetationally inferred, uniform regional climate. In practice, this may be thought of as a geographic area within which the same vegetation unit (plant association) occurs on zonal sites. A subzone boundary occurs when a different plant association occurs on zonal sites. The zonal site plant association is used to characterize the subzone. For example, in the Interior Douglas-fir Very Dry Warm (IDFxw) subzone found in the southern part of the Cariboo Forest Region, zonal sites are occupied by the *Fd - Juniper - Bluebunch wheatgrass* plant association, while at higher elevations in the

Interior Douglas-fir Dry Cool (IDFdk) subzone, zonal sites are occupied by the *FdPl - Pinegrass - Feathermoss* plant association.

Biogeoclimatic subzones with similar climatic characteristics and vegetation on zonal sites are grouped into biogeoclimatic zones. A zone includes geographic areas with broadly uniform climate and patterns of vegetation and soil development. It typically has consistent climax tree species on zonal sites. Distinguishing features of specific biogeoclimatic zones in the Cariboo Forest Region are described in Section 5.

Subzones may include significant climatic variation marked by small changes in the vegetation on zonal sites and differences in the vegetation on non-zonal sites. In these cases, the subzone may be subdivided into biogeoclimatic variants. Variants are generally recognized for areas that are slightly drier, wetter, snowier, warmer, or colder than that considered typical for the subzone. These climatic differences result in corresponding differences in vegetation, soil, and ecosystem productivity, although the changes in the vegetation are not sufficient to define a new plant association. Differences in vegetation are often changes in the proportion and vigour of certain plant species or variations in successional development or the overall sequence of vegetation over the landscape.

Naming Biogeoclimatic Units

Biogeoclimatic zones are typically named after one or more dominant climax tree species occurring on zonal sites, often in combination with a geographic or climatic modifier. For example, the Interior Cedar–Hemlock Zone and Coastal Western Hemlock Zone both have western hemlock as a climax species on zonal sites but occur in different climates and geographic areas. Biogeoclimatic zone names are often referred to by a two- to four-letter acronym. For example, the Interior Cedar–Hemlock Zone is referred to as the ICH Zone and the Montane Spruce Zone is referred to as the MS Zone.

Biogeoclimatic subzones are named according to their relative climate within the zone: whether their climate is drier or wetter, colder or warmer, or more or less continental (in the case of coastal zones) than the climate of other subzones within the zone. The first part of the subzone name describes the relative precipitation and the second part describes either the relative temperature (Interior zones) or relative continentality (Coastal zones). These names are usually abbreviated by a letter code as shown in Table 1.

TABLE 1 Subzone name codes

First Part Relative Precipitation		Second Part Relative Temperature or Continentality	
Name	Code	Name	Code
very dry	x	hot	h
dry	d	warm	w
moist	m	mild	m
wet	w	cool	k
very wet	v	cold	c
		very cold	v
		hypermaritime	h
		maritime	m
		submaritime	s

Biogeoclimatic variants are given geographic names reflecting their relative location or distribution within the subzone. For example, the Interior Douglas-fir Dry Cool Subzone (IDFdk) has four variants: Thompson Variant, Cascade Variant, Fraser Variant, and Chilcotin Variant. Variant names are given number codes, which in most cases reflect their geographic distribution within the subzone from south to north.

The coding convention for Interior biogeoclimatic units is as follows (using the Interior Douglas-fir Dry Cool Subzone, Fraser Variant):

Zone	Subzone	Variant
IDF	**dk** / \ moisture temperature	**3**

Site Classification

Concepts

Within each biogeoclimatic subzone or variant, a recurring pattern of sites reflects the variation in soil and physiographic properties. These sites are classified into site units according to their potential to produce similar climax vegetation units (plant associations or subassociations). It is assumed that sites with similar plant communities have similar environmental properties, particularly soil moisture, soil nutrient, and site temperature regimes. Site units can be identified by their environmental characteristics or by their climax vegetation unit (plant association or subassociations) if the climax or near-climax vegetation is present. It is important to note that a particular site unit can support a variety of plant communities of different successional stages, but it has the potential to have only one climax or near-climax plant community.

Three site units are formally recognized in the BEC site classification: site association, site series, and site type. A fourth unit, the site phase, is also used in this guide.

The **site association** is the basic unit of site classification and includes all sites capable of producing the same climax plant community regardless of which biogeoclimatic unit they occur in. Thus a site association is a group of related ecosystems that are physically and biologically similar enough that they would have similar vegetation at climax. Although a site association occurs on ecologically equivalent sites, it may occupy different positions on a scale of relative moisture and nutrients in different biogeoclimatic subzones. For example, the *Sxw - Oak fern* site association occurs in both the SBSmw and SBSwk subzones. In the SBSwk it occurs on zonal sites, while in the slightly drier climate of the SBSmw it is restricted to sites wetter than zonal sites.

Site series are subdivisions of site associations and include all sites within a biogeoclimatic subzone that are capable of producing the same climax vegetation unit (plant association). Site series is the most commonly used category in the site classification. It is approximately equivalent to the "ecosystem association" used in previous draft ecological field guides for the Cariboo Forest Region.

Site type represents the most detailed level in the site unit classification. Site types are subdivisions of site series that are distinguished by edaphic differences that are considered significant to management of the site. However, since the site type classification system is not yet fully developed, it is not used in this guide. Refer to Pojar *et al.* (1991a) for a more detailed discussion of site types.

Site phase, although not a formal unit in the site classification system, is used in this guide in place of the site type, to allow better site differentiation for forest management considerations. Site phases are conceptually very similar to site types and are intended for use only until the site type classification is completed provincially. As with site types, site phases are used to differentiate sites belonging to the same site series but with site or soil properties that may differ sufficiently to affect management implications. The site or soil differences have the same net effect on vegetation. For example, sites with shallow soils over bedrock and with coarse gravelly soils may have the same climax vegetation unit but different management implications. The use of site phases allows more consistent prediction of ecosystem response to management treatments.

Naming and Numbering of Site Units

Forested site associations are named using one or two tree species, followed by one or two understory plant species present in the climax or late seral vegetation unit (plant association) on which they are based. While the species chosen for naming the site association are often abundant in the climax vegetation, less common but characteristic species are sometimes used to ensure that the site unit has a unique name within the provincial classification.

Site series names use the same names as the site associations to which they belong, preceded by the appropriate biogeoclimatic subzone or variant name (or code). For example, the *ICHwk2/ CwHw - Oak fern* (or *ICHwk2/01*) represents the zonal site series in the ICHwk2. Zonal site units are always numbered 01. Non-zonal forested site series are numbered from 02 to 29 sequentially in order of increasing moisture regime and secondarily in order of increasing nutrient regime. For example, in the SBPSdc the driest unit is coded SBPSdc/02, while the wettest unit is coded as SBPSdc/08.

Site phases are named according to their differentiating criteria and given a single, non-connotative lowercase letter code after the site series number. For example *SBPSdc/02a* denotes the typic (deep soil) phase, while *SBPSdc/02b* denotes the shallow soil phase.

Seral Classification

The seral (often termed successional) classification in BEC is an integration of site and vegetation classifications with structural stage development. Very little classification of seral ecosystems has occurred using the BEC system and no seral ecosystems are presented in this guide. Hamilton (1988) presents a proposed approach to classifying seral ecosystems.

3 PROCEDURES FOR SITE DESCRIPTION AND IDENTIFICATION

This section summarizes procedures for describing and identifying site units in the Cariboo Forest Region. More comprehensive and detailed procedures and terminology for describing sites, soils, and vegetation are presented in Luttmerding *et al.* (1990).

Site identification involves two major steps. The first is to identify the biogeoclimatic subzone and variant and the second is to identify the site unit. These are accomplished through field assessment of site, soil, and vegetation characteristics and comparison of these characteristics with information presented in this guide and on biogeoclimatic maps. In order to simplify the identification process, especially for those new to an area, several aids to site description and identification are presented in this guide. These include guides to identifying site characteristics such as soil moisture and nutrient regimes, maps, summaries of vegetation and site characteristics, edatopic grids, keys to site units, and descriptions of biogeoclimatic and site units. As forest managers become more familiar with the ecosystems in their area, they will likely become less dependent on these aids for ecosystem description and identification.

Due to the importance of correct site description and identification to subsequent decisions regarding forest management practices, it is essential that site description data be collected as carefully and accurately as possible.

Identifying Biogeoclimatic Units

A preliminary identification of the biogeoclimatic subzone and variant of a specific site can be made by locating the site on a map of biogeoclimatic units of the Cariboo Forest Region. A 1:500 000 scale version of this map is available from the Cariboo Forest Region office (Research Section) in Williams Lake. A provincial biogeoclimatic map is available in digital format. The biogeoclimatic map of the Cariboo Forest Region is based on the best currently available information at the time of publication and is updated periodically. However, it must be recognized that map unit boundaries will likely require some minor modifications as additional detailed information is collected. Therefore, the map should not be relied on completely for biogeoclimatic unit identification, especially for sites near currently mapped boundaries.

The preliminary map-based identification of biogeoclimatic unit should be confirmed in the field. To do this most effectively, the user should examine zonal sites or other sites with medium (mesic) moisture regime and medium nutrient regime on gentle to moderate slopes. Elevation, tree species composition (canopy and regeneration layers), and principal shrub and herbaceous species should be noted and compared to the descriptions of biogeoclimatic zones and subzones in Section 5—"Biogeoclimatic Units of the Cariboo Forest Region." The user should also refer to the Site Unit Section (Section 6) for a list of vegetation attributes used to distinguish a particular biogeoclimatic subzone or variant from others with which it shares a border. This is particularly useful if the site is near a boundary between two or more biogeoclimatic units. A list of distinguishing vegetation attributes is included in each biogeoclimatic subzone or variant subsection of Section 6.

If the site of interest is located in a transition between two subzones or variants, or if doubt remains even after attempting field verification, then the site units for both possible subzones should be identified. The descriptions and interpretations for both subzones should be compared, and any interpretations and prescriptions should reflect the transitional nature of the site. Ecologists in the Cariboo Forest Region office in Williams Lake may be able to provide assistance in identifying biogeoclimatic subzones and variants in difficult, transitional areas.

Describing and Identifying Site Units

Site unit identification requires:

1) accurate description (determination and recording) of site, soil, and vegetation characteristics; and
2) use of the various aids and descriptive materials in this guide to determine the site unit that best matches these characteristics.

It should not be expected that sites will perfectly match all details in the description of a site unit in this guide. Sites that are classified within a site unit represent a population cluster around a central concept. The site should reasonably match the concept and principal features of a site unit but may not perfectly match all the details of the site unit description. It is important to note that the classification presented in this guide was developed primarily from climax or late-seral forests. Differences in vegetation composition and cover should be expected when dealing with earlier seral stages.

Although the classifications and descriptions of site units in this guide represent most of the variability expected to be encountered in the forests of any particular subzone or variant, there are still likely to be some forest ecosystems that do not appear to fit any described site unit reasonably well. This may be due to the fact that the ecosystem is located in a geographically transitional area between two or more biogeoclimatic subzones or variants, so that the site reflects the transitional climate. In this case, the descriptions and interpretations for both subzones should be compared, and any interpretations and prescriptions should reflect the transitional nature of the site. Secondly, a "poor fit" may be due to the fact that the plot from which data were collected is in a transitional location between two site units or overlaps two site units. In this case, the plot might be relocated to more accurately represent the typical ecosystems within the area of interest. Thirdly, a "poor fit" may be due to the fact that a new ecosystem has been encountered that has not yet been described for the subzone or variant. If this is thought to be the case, it should be brought to the attention of a regional ecologist in the Cariboo Forest Region office.

Describing Sites

Identifying site units requires careful observation and accurate description of site, soil, and vegetation features. The following steps are recommended.

Step 1. Select Sample Area. Locate an area of at least .04 ha (400 m^2) that is relatively homogeneous in vegetation composition, topography, and soil drainage and is representative of the ecosystem to be classified. The area should not include pronounced differences in site, soil, or vegetation that may indicate a second site unit.

Step 2. Determine and Record Site and Soil Features. Determine and record the site and soil features that are important for site identification and interpretation. Site features should represent the entire sample area. Soil features should be recorded in a soil pit dug to a depth of at least 50 cm and located in a representative microsite of the sample area. Microsites with atypical surface organic materials, soil drainage, or microtopography should be avoided.

Table 2 lists some of the most important site and soil attributes that should be described and the aids presented in this guide for describing these attributes.

TABLE 2 Important site and soil features for identifying site units

Feature	Definition and Description Aids
elevation (m)	from topographic map or altimeter
slope gradient (%)	average inclination from bottom to top of the sample area; from clinometer
slope aspect (degrees)	predominant direction (azimuth) that the slope of the sample area is facing; note if aspect of sample area differs from that of larger slope; from compass
mesoslope position	relative position of sample area within a moisture catchment area; see Figure 2 below and definitions in Appendix 4

TABLE 2 (continued)

Feature	Definition and Description Aids
soil texture	classes of percent sand, silt, and clay; especially record the predominant texture in the rooting zone; see Appendix 9
soil coarse fragment content (%)	% by volume of mineral fragments greater than 2 mm in diameter, including gravel, cobbles, and stones
surficial materials class	mode of deposition of soil parent materials; see Appendix 7
soil depth to impermeable layer (cm)	average depth from top of mineral soil to bedrock or other impermeable layer
depth to seepage water, water table, or gleying	depth at which water is seeping out of soil pit wall or where soils are mottled (orange splotches) or gleyed (colour of soil matrix dull olive to dull grey)
humus form	humus form order of the surface soil organic layers; see Appendix 12

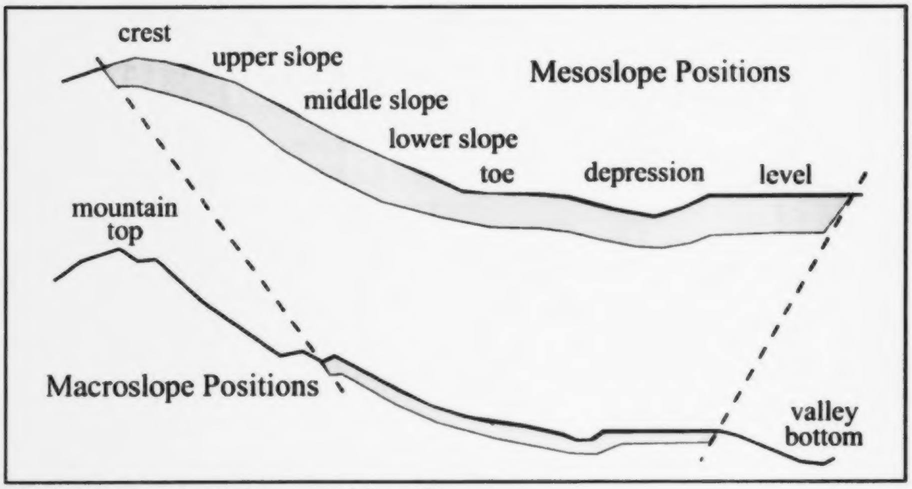

crest
upper slope
Mesoslope Positions
middle slope
lower slope
toe
depression
level
mountain top
Macroslope Positions
valley bottom

FIGURE 2 Mesoslope position diagram.

Step 3. Determine and Record Vegetation Features. Identify and record the percent ground cover of as many of the plant species as possible in each of the following vegetation layers:

- **dominant/codominant trees:** tallest trees and trees forming the main forest canopy;
- **intermediate or suppressed trees:** trees >10 m tall but below the main forest canopy;
- **tall shrubs:** woody plants 2–10 m tall; includes tree species;
- **low shrubs:** woody plants <2 m tall, except dwarf shrubs; includes tree species;
- **herbaceous species and dwarf shrubs:** non-woody species (forbs, grasses, sedges, rushes, etc.) and dwarf shrubs (woody and semi-woody species that are largely lying decumbent on the surface and seldom > 10 cm tall);
- **mosses and lichens:** all mosses, liverworts, lichens, and tree species germinants.

Estimating percent ground cover of the foliage of a plant species is a skill that improves with practice. Percent ground cover may be thought of as the percent of the ground surface that would be in the shadow of a plant species if a light source were directly overhead. In practice it is often helpful for reference to identify an area that is 1% of the plot, and also to determine the percentage of the plot that a given object such as a clipboard covers. For example, in a .04 ha plot, 1% of the plot is a 2 x 2 m area. Appendix 14 contains comparison charts for visual estimation of percent cover.

A list of common plant names (and their corresponding scientific names) used in this guide is presented in Appendix 13. Common names of plants largely follow Douglas *et al.* (1989, 1990, 1991, 1993) for vascular species and Meidinger (1987) for non-vascular species. Scientific names follow Douglas *et al.* (1989, 1990, 1991, 1993) for vascular plants, Ireland *et al.* (1987) for mosses, Stotler and Crandall-Stotler (1977) for liverworts, and Noble *et al.* (1987) for lichens. The Cariboo Forest Region office maintains a plant herbarium to assist in identifying unknown specimens. It includes collections of nearly all plant species known to occur within the Cariboo Forest Region.

Step 4. Determine Relative Soil Moisture and Soil Nutrient Regime. Relative soil moisture and soil nutrient regimes can be derived from the site and soils information collected above. Appendix 4 presents a guide to identification of soil moisture regime, while Appendix 6 presents a guide to identification of soil nutrient regime.

Identifying Site Units

Once the site, soil, and vegetation information has been recorded for an ecosystem and the soil moisture and nutrient regimes have been determined, the site series can be identified. Several tools are provided in Section 6 to assist the identification. These include a brief narrative description of each of the forested site series, dichotomous keys to site unit identification, edatopic grids, idealized landscape profiles showing the relative distribution of site series, tables summarizing site features of each site series, and a vegetation table showing the abundance of selected plant species in each site series.

The following procedure is recommended for identifying site units.

Step 1 Once the subzone/variant has been identified and the important site, soil, and vegetation features have be identified and recorded, turn to the "Key to Site Units" in the appropriate subzone and variant subsection of Section 6. Work through the key, selecting the best alternative of the two choices at each step of the key until arriving at a site series name. This should be considered a tentative identification.

Step 2 Verify the tentative site series identification from Step 1 by comparing the attributes recorded for the ecosystem with those in the site features summary table to ensure that site attributes are within the range normally found in the site series. The site series narrative descriptions, edatopic grid, vegetation table, and landscape profile for the subzone should also be compared with the recorded ecosystem attributes as a further confirmation of correct identification. If the ecosystem attributes recorded for the site generally match those described for the site series, then the site series has been correctly identified. Minor variation between the characteristics described in the guide and those recorded for the site can be anticipated.

Step 3 If there is significant disagreement between the attributes recorded for the ecosystem and those described for the site series identified in Step 1, then the user should check that the site attributes were recorded correctly and the correct choices were made in the dichotomous key. If after re-evaluation a satifactory match is still not present between the site characteristics and the descriptions in this guide, contact a regional ecologist in the Cariboo Forest Region office.

Identifying Seral Units

Field foresters, wildlife managers, and others are increasingly working with non-climax or seral ecosystems as more of the landscape is managed. Although the site unit keys and other aids to site unit identification were designed primarily for use in mature forests, most seral ecosystems can also be identified with these aids. Accurate site and soils information is usually sufficient to tentatively identify most site units even in early seral stages. However, the vegetation features used in the keys and other aids cannot be reliably used to confirm the identification. In a small number of cases, site series identification in the site unit keys relies almost entirely on vegetation. In these cases, other aids such as the summary table of site features, edatopic grid, and narrative description should be given greater emphasis than the keys to site units. Remnant mature vegetation found on the site or in an adjacent mature stand may also be used to assist in the vegetation assessment required for the keys.

4 ENVIRONMENT OF THE CARIBOO FOREST REGION

The Cariboo Forest Region is an area of about 8.21 million ha in the central Interior of British Columbia. It extends from about 51°00' to nearly 52°30' north latitude and from about 120°30' to nearly 125°45' west longitude. Western portions of the Region are within about 100 km of the main coastline of the Pacific Ocean but are separated from it by the high Coast Mountains. A location map is included in Section 1.

Physiography

The Cariboo Forest Region landscape is predominantly a plateau between two mountain systems (Figure 3). The plateau is part of the Interior Plateau of British Columbia (Holland 1976), a level to gently rolling landscape with incised river valleys and uplands locally rising above the general surface. Elevations of the plateau are predominantly 900–1500 m, rising to over 2000 m on local uplands. On the western side of the plateau, the landscape rises abruptly onto leeward slopes of the Coast Mountains. Peaks in this moderately to highly dissected landscape rise to elevations of 2700 to nearly 4000 m, with several peaks in the 3000–3300 m range. On its eastern side, the plateau landscape rises gradually through a broad transition to the Columbia Mountains. The landscape becomes increasingly dissected as it rises towards the Columbia Mountains, where elevations of summits are generally 2400–3600 m.

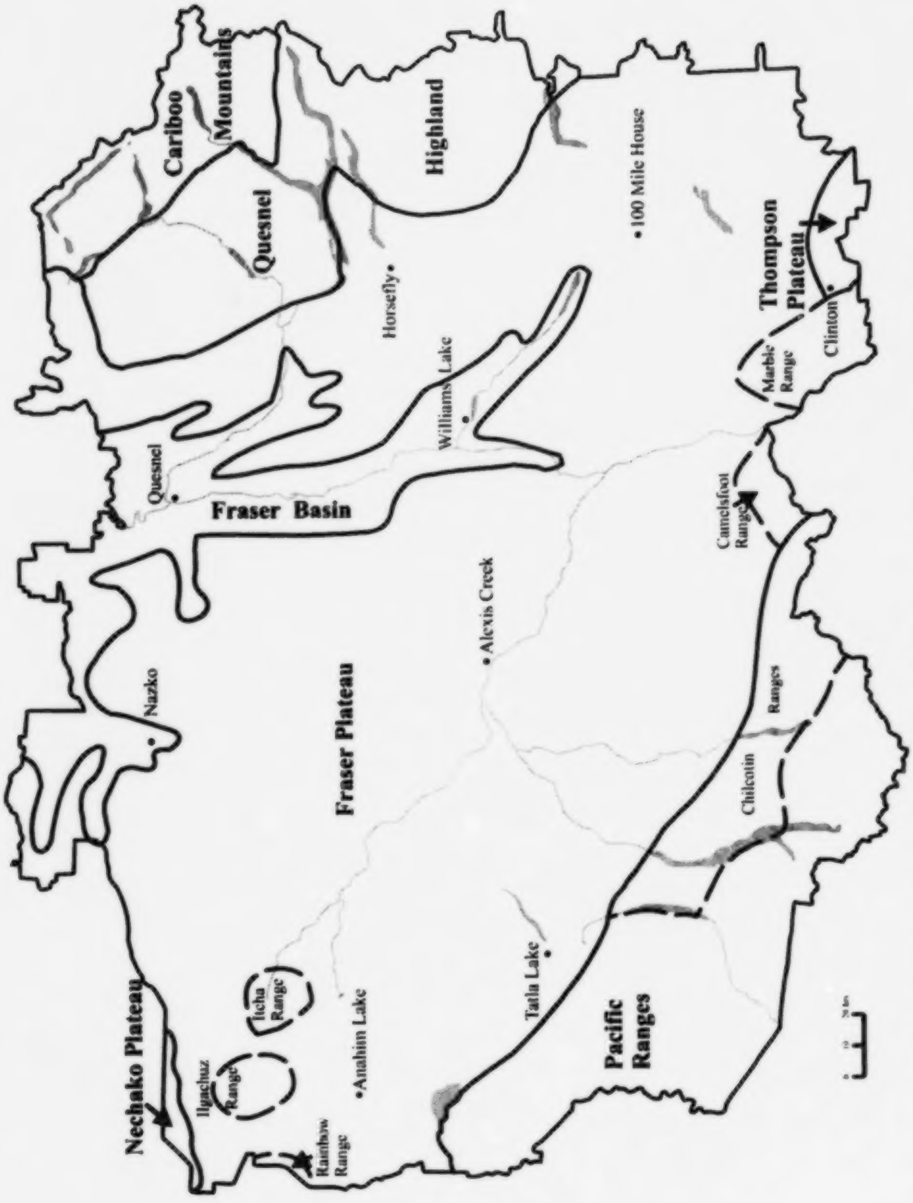

Cariboo Mountains
Quesnel
Highland
100 Mile House
Horsefly
Williams Lake
Quesnel
Fraser Basin
Thompson Plateau
Marble Range
Clinton
Camelsfoot Range
Nazko
Alexis Creek
Fraser Plateau
Chilcotin Ranges
Tatla Lake
Pacific Ranges
Nechako Plateau
Ilgachuz Range
Itcha Range
Anahim Lake
Rainbow Range

FIGURE 3 Physiographic subdivisions of the Cariboo Forest Region.

The Interior Plateau, Coast Mountains, and Columbia Mountains are further subdivided into smaller, more uniform physiographic subdivisions (Holland 1976). The Interior Plateau is represented in the Cariboo Forest Region primarily by the Fraser Plateau, Fraser Basin, and Quesnel Highland, with very small areas of the Nechako Plateau and Thompson Plateau. The Fraser Plateau covers the majority of the Cariboo Forest Region (Figure 3) and is predominantly a level to gently rolling landscape with elevations of 900–1500 m. It is underlain primarily by flat-lying to gently dipping olivine basalt bedrock, which in most areas is covered by a mantle of medium- to coarse-textured glacial till. In some areas the till is shaped by glaciers into drumlins. The Rainbow, Ilgachuz, Itcha, Camelsfoot, and Marble ranges are weakly dissected uplands that locally rise above the general plateau surface to elevations of 1500–2500 m.

The Fraser Basin occurs primarily to the north of the Cariboo Forest Region where it is a low-relief, low-lying plain covered by glacial till and glacial lake deposits. The till is frequently drumlinized. The Fraser Basin extends into the Cariboo Forest Region along the valleys of the lower Blackwater (West Road) River and the Fraser River north of the confluence with the Chilcotin River. In this area, the plateau surface is deeply incised by the river valleys.

The Quesnel Highland is a broad transition, about 50 km wide, from the Fraser Plateau to the Cariboo Mountains (part of the Columbia Mountains) on the east side of the Interior Plateau (Figure 3). The upland areas within this highland are remnants of a highly dissected plateau of moderate relief (Holland 1976). These remnants rise gradually from about 1500 m on the west to nearly 2300 m on the east near the Cariboo Mountains. This area is underlain primarily by folded schistose rocks with infolds of volcanic and sedimentary rocks (Holland 1976). Summits are mostly rounded because they were covered by Pleistocene glaciers, but cirques have developed since deglaciation on northern sides, resulting in a sharpening of summits.

The Nechako Plateau includes a very small area of the Cariboo Forest Region north of the Ilgachuz Range (Figure 3). The Thompson Plateau includes a very small area in the southeastern portion of the Cariboo Forest Region, east of Clinton (Figure 3).

The Coast Mountains is represented in the Cariboo Forest Region by the Pacific Ranges, including the Chilcotin Ranges, a physiographic subdivision of the Pacific Ranges (Figure 3). The Pacific Ranges is a highly dissected landscape, which includes the highest peaks of the Coast Mountains. Summit elevations are commonly 3000–3300 m and rise to approximately 4000 m on Mount Waddington. Except in the Chilcotin Ranges, the mountains are essentially granitic with icefields and extensive evidence of ice erosion. The high peaks are sculptured by cirque glaciers. The Homathko and Klinaklini rivers drain from the Fraser Plateau through the Coast Mountains to inlets of the Pacific Ocean. As a result, the valleys of these mountains are influenced by mild coastal air. The Chilcotin Ranges lie along the eastern edge of the Pacific Ranges (Figure 3). The mountains in this area are composed largely of non-granitic rocks and are characterized by lower, rounded summits and gently dipping areas of undissected upland (Holland 1976).

The Columbia Mountains are represented in the Cariboo Forest Region by the Cariboo Mountains, which occur from Bowron Lakes Provincial Park south to the area between the North and East Arms of Quesnel Lake. In total it occupies a small proportion of the Region. The Cariboo Mountains are composed of folded sedimentary and metamorphosed sedimentary rocks in which the principal rock type is quartzite, although some limestone is also present (Holland 1976). They have been intensely glaciated. Elevations of summits within the Cariboo Forest Region are mostly 2400–2700 m but, further eastward, elevations rise to nearly 3600 m.

The history of mountain uplift and Quaternary glaciation in British Columbia is summarized by Ryder (1978).

Climate

The climate of the Cariboo Forest Region is largely determined by physiographic features and their effects on principal air masses. The Region is affected by three principal air masses: warm, moist Pacific air from the west; cold, dry Arctic air from the north; and warm, dry Great Basin air from the south.

Since the Cariboo Forest Region is in the lee of the Coast Mountains, the moist Pacific air does not have a major effect on the climate of the Region (Annas and Coupé 1979). Western portions of the Fraser

Plateau, which are strongly affected by the Coast Mountains rainshadow, are among the driest parts of the Region. Total annual precipitation near Tatla Lake is only 338 mm. Elevations in this part of the Fraser Plateau are generally above 1300 m and, as a result, growing seasons are short and summers cool. Intense radiation cooling resulting from clear skies and low humidity results in frequent summer frost (Steen and DeMarchi 1991). In the northern part of the Region, the effects of the Coast Mountains are less intense, probably due in part to the fact that the Coast Mountains are lower and less extensive north of 52° latitude (Annas and Coupé 1979). In addition, interactions between the Pacific and Arctic air masses are more frequent and, as a result, annual precipitation in northwestern areas is generally greater than 450 mm.

As the Pacific air moves eastward across the Fraser Plateau, humidity and precipitation increase slightly. Mean annual precipitation at Williams Lake is 413 mm and at Horsefly is 564 mm. Further eastward, the westerly flow of air rises over the Quesnel Highland and eventually the Cariboo Mountains. As it does, precipitation increases quickly. Average precipitation at relatively low elevations near Bosk Lake, Doreen Creek, and Big Slide Mountain is 736, 861, and 987 mm, respectively, while at higher elevations on Boss Mountain it is 1177 mm. Elevations of the eastern Fraser Plateau and bottoms of major valleys in the Quesnel Highland are generally below 1100 m and, as a result, temperatures are warmer than on the higher plateau in the western parts of the Fraser Plateau. In addition, the higher humidity and cloud cover results in less radiation cooling during the summer, and frosts are less frequent. At high elevations of the Quesnel Highland, growing seasons are very short and summers are cool.

During summer months, the westerly flow of Pacific air is diminished by the large Pacific high-pressure centre (Schaefer 1978). Much of the precipitation during the summer is the result of numerous convective storms.

The Arctic air mass is well north of the Cariboo Forest Region during most of the summer but affects the climate during the winter months, resulting in periods of very cold temperatures. However, the Rocky Mountains shield the Cariboo Forest Region as well as most other parts of central and southern British Columbia from the full effects of the cold

Arctic air (Schaefer 1978). As a result, the Cariboo Forest Region does not experience the same degree and duration of cold as the Great Plains east of the Rocky Mountains. High snowfall events often occur when the cold Arctic air invades the region and interacts with the moister Pacific air. Northern parts of the Cariboo Forest Region are more affected by Arctic air incursions than are southern portions and, as a result, the northern areas experience colder, snowier winters and cooler summers. For example, mean annual temperature at Ashcroft (elevation 305 m) is 8.7°C, while at Quesnel (elevation 488 m) it is 5.0°C.

Warm Great Basin air has relatively little effect on the climate of the Cariboo Forest Region except in the Fraser River valley south of the Chilcotin River confluence. During the summer, hot, dry air can penetrate the Region from the south, resulting in high daytime temperatures and clear skies. Incursions of this air mass are limited by the Cascade and Coast mountains, the relatively high elevations of the Fraser Plateau, and the narrowness of the Fraser River valley.

Mean temperature and precipitation data for the biogeoclimatic subzones of the Cariboo Forest Region are presented in Section 5.

Vegetation and Soils

Major vegetation patterns in the Cariboo Forest Region reflect the patterns of climate, topography, and surficial geological materials. On the dry, cold leeward slopes of the Coast Mountains and the western and southwestern portions of the Fraser Plateau, lodgepole pine forests dominate the landscape and are generally the climax forest type. These forests are relatively open, and trees are slow growing and relatively small, often less than 20 m tall at maturity. In northwestern parts of the Cariboo Forest Region where precipitation is somewhat higher, spruce is more frequent in the pine forests. Spruce forests also become more frequent at higher elevations and on moist sites adjacent to wetlands. In the Chilcotin River valley and the valley and plateau adjacent to the Fraser River where elevations become lower and summer temperatures are higher, Douglas-fir forests are well represented on the landscape, usually in mixtures with lodgepole pine forests. In these dry climates, Douglas-fir is the climax tree species on most sites. Further eastward, as precipitation increases, the Douglas-fir forests become seral to spruce forests, which become increasingly common. Still further eastward in the Quesnel Highland where precipitation is high, the forest contains a rich assemblage of tree species and tree growth rates are high. Climax forests at low elevations south of the Cariboo River are most often dominated by western redcedar or western hemlock, while at high elevations and north of the Cariboo River, climax forests are dominated by spruce (hybrid white spruce or Engelmann spruce) and subalpine fir. Douglas-fir and lodgepole pine are common seral tree species. Small deciduous forests occur throughout most of the Fraser Plateau and Quesnel Highland, but are most common and extensive in the Fraser Basin physiographic unit in northern parts of the Region and on southeastern parts of the Fraser Plateau, south of Canim Lake. Grasslands, often with sagebrush, dominate the landscape on slopes of the Fraser River valley south of the confluence with the Chilcotin River.

Soil parent materials in the Cariboo Forest Region are predominantly glacial till of medium to coarse texture. The till materials were generally transported only relatively short distances by Pleistocene glaciers and, as a result, the composition of the till often reflects the local bedrock. Coarse-textured tills are especially common on the western Fraser Plateau where they were derived from granitic rocks of the Coast Mountains. Colluviated till occurs on steep slopes in the mountains. Glaciofluvial deposits, forming outwash plains, terraces, and eskers occur locally, especially in valley bottoms. Lacustrine deposits occur locally, especially in the Fraser Basin physiographic unit. Deep organic deposits have a small extent and are very localized.

Soil development reflects the climate, vegetation, and surficial geological materials. Dystric Brunisols are the most common soil type in the dry lodgepole pine forests of the western Fraser Plateau and adjacent slopes of the Coast Mountains. At higher elevations, Humo-Ferric Podzols have developed in some deep, coarse-textured materials. Eastward towards the Fraser River valley, Brunisolic Gray Luvisols are also common but they are often weakly developed. Further east across the Fraser River, where climax forests are dominated by Douglas-fir, Orthic Gray Luvisols are most common and are well developed. Closer to the Quesnel Highland, as precipitation increases and spruce become more common, these soils are replaced by Brunisolic Gray Luvisols as the most common soil subgroup. In the still wetter climates of the Quesnel

Highland, Dystric Brunisols and Humo-Ferric Podzols are common. The Podzols are most common at higher elevations. Chernozems are the principal soil order in the dry grasslands of the Fraser River valley. Throughout the region, Gleysols occur in poorly drained, wet mineral materials. Organic soils are common in wet depressions but are generally localized and not extensive.

Principal soils and soil-forming factors on British Columbia landscapes pertinent to the Cariboo Forest Region are summarized by Valentine and Dawson (1978), Jungen and Lewis (1978), and Wittneben and Lacelle (1978).

5 BIOGEOCLIMATIC UNITS OF THE CARIBOO FOREST REGION

Introduction

This chapter describes the biogeoclimatic zones, subzones, and variants that occur within the Cariboo Forest Region. The descriptions are organized alphabetically by biogeoclimatic zone and include a brief description of the location and distinguishing features, climate, vegetation, and soils of each principal zone. The general description of each zone is followed by a brief synopsis of each of the subzones and variants of the zone that occur within the Region. References to other sources of information on the zones and subzones are also provided. Ten biogeoclimatic zones occur within the Cariboo Forest Region, although two of them have a very minor area within the Region:

AT - Alpine Tundra Zone (no subzones defined)

BG - Bunchgrass Zone (two subzones)

CWH - Coastal Western Hemlock Zone (very small area in Region—potentially two subzones)

ESSF - Engelmann Spruce–Subalpine Fir Zone (six subzones)

ICH - Interior Cedar–Hemlock Zone (four subzones)

IDF - Interior Douglas-fir Zone (five subzones)

MH - Mountain Hemlock Zone (very small area in Region—one subzone)

MS - Montane Spruce Zone (four subzones)

SBPS - Sub-Boreal Pine–Spruce Zone (four subzones)

SBS - Sub-Boreal Spruce Zone (five subzones)

BGC UNITS

The purpose of this chapter is to assist the reader to understand the attributes that distinguish and characterize each of the biogeoclimatic units in the Region. Tables of climate and plant species abundance data are provided for reference. The user should also refer to the Site Unit Section (Section 6) for attributes used to distinguish a particular biogeoclimatic subzone or variant from others with which it shares a common border.

Descriptions of the forested site units within each of the biogeoclimatic units of the Region are contained in Section 6. Non-forested site units of the Cariboo Forest Region will be described separately in other guides.

AT
Alpine Tundra Zone

Overview

Location and Distinguishing Features The Alpine Tundra Zone occurs on high mountains throughout British Columbia at elevations above the limits of forests (Pojar and Stewart 1991). In the Cariboo Forest Region, it is most extensive in the Coast Mountains where it occurs at elevations from about 2000 to nearly 4000 m. It is also common in the Quesnel Highland and Cariboo Mountains and on other localized high summits (Ilgachuz, Itcha, Camelsfoot, and Marble ranges) of the Region. In the Quesnel Highland and Cariboo Mountains, it generally occurs at elevations above 1800 m. Total area of the zone in the Cariboo Forest Region is approximately 669 000 ha.

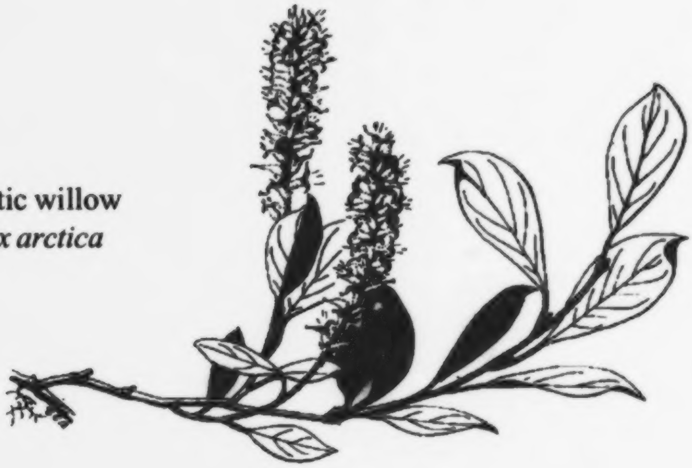
The AT Zone is a treeless area dominated by alpine meadows, shrublands, snowfields, glaciers, and rock. Tree species are present, especially at lower elevations, in stunted, dwarfed, or krummholz forms, but forests of tree-sized stems are not present.

The boundary between the ESSF Zone (or MH Zone) and the AT Zone is sometimes narrow, especially in the Quesnel Highland, and sometimes broad, especially in the Coast Mountains. The transition from open forest to treeless alpine often includes a krummholz band in which clumps of stunted, deformed trees occur within a matrix of alpine meadows and grasslands. For purposes of biogeoclimatic mapping and classification, this band is included within the AT Zone.

Climate The AT has a cold, snowy, and windy climate with only a very short frost-free period. Although there are no long-term climatic data from the AT Zone in the Cariboo Forest Region, mean annual temperatures are probably less than 0°C throughout the AT Zone and coldest on Coast Mountain summits nearest the Fraser Plateau. Mean annual precipitation in the Quesnel Highland and Cariboo Mountains, which is the wettest alpine area in the Region, is probably greater than 1500 mm. Peak snowpack in this area is highly variable depending on exposure to winds. Exposed areas may remain nearly snow-free, while protected areas may have more than 3 m of snow. On the leeward side of the Coast Mountains, the alpine climate is much drier and the snowpack much thinner. Winds remove much of the snow from large exposed areas.

Vegetation The vegetation of the AT Zone varies considerably depending on regional climate and site microenvironment. In the Quesnel Highland and Cariboo Mountains, where precipitation is high, herb meadows dominated by broad-leaved forbs and graminoids up to 1 m tall are common. These occur primarily on moist, deep soils that are protected from strong winter winds. In other areas, most plants are low-growing and often separated by unvegetated mineral soil or rock. Wet seepage areas often have a sedge and low willow vegetation, while exposed ridges have a dwarf scrub of prostrate woody plants and dwarf herbs. In the drier Coast Mountains, herb meadows are much less common, and dwarf scrub vegetation with moderate to sparse plant cover occupies much of the landscape. At high elevations of the Coast Mountains, soils typically have little plant cover. Alpine grasslands occur locally in the Quesnel Highland, Coast Mountains, and other alpine areas of the Region. Common alpine plant species in the Quesnel Highland include sedges, arctic lupine, subalpine daisy, Indian hellebore, arnica, louseworts, western pasqueflower, paintbrushes, and partridgefoot. On the leeward slopes of the Coast Mountains, common species include kinnikinnick, alpine bluegrass, mountain sagewort, draba, dwarf willows, yarrow, and lousewort. Lichens are common, especially in rocky areas.

Alpine ecosystems in the Cariboo Forest Region have been little studied. Although broad differences are recognized between the Quesnel Highland and Coast Mountains, biogeoclimatic subzones have not been defined nor have plant associations been adequately described or classified.



Arctic willow
Salix arctica

BG
Bunchgrass Zone

Overview

Location and Distinguishing Features The Bunchgrass (BG) Zone includes all portions of the Cariboo Forest Region where grasslands are the climax vegetation on zonal sites. Forests occur on moist sites and cool north-facing slopes but zonal sites are generally too dry for the establishment of forest vegetation. In the Cariboo Forest Region, the BG Zone occurs in the Fraser River valley in the southern half of the Region and in the lower Chilcotin River valley. It occurs primarily at elevations below 800 m. The Bunchgrass Zone also occurs in major river valleys in the Southern Interior of British Columbia (Nicholson *et al.* 1991). The northern limit of the BG Zone in British Columbia is approximately the confluence of the Fraser and Chilcotin rivers in the Cariboo Forest Region.

Not all grasslands of the Cariboo Forest Region are included in the BG Zone. Grasslands are also common in forest-grassland parklands in parts of the Interior Douglas-fir (IDF) Zone, especially in the very dry (IDFxw and IDFxm) subzones (see IDF Zone description). However, the climax vegetation on zonal sites in the IDF zone is a forest community. Where grasslands are present on zonal sites, they are primarily a seral stage in the development of forests. In the transition between the BG and IDF zones, some grasslands are long-persisting seral stages.

Grasslands of the IDF Zone are distinguished from those of the BG Zone by having common porcupine grass, spreading needlegrass, and Rocky Mountain fescue but little or no needle-and-thread grass in late seral vegetation on zonal sites.

Climate The BG Zone includes the warmest and driest areas of the Cariboo Forest Region. The climate is characterized by warm to hot, dry summers and moderately cold winters with little snowfall (Table 3). Peak snowpack is generally less than 50 cm, and, for much of the winter, snow may be absent on sun- or wind-exposed areas. Soils are generally moist for only a short time in the spring (April–early June) following snowmelt. By early summer, soils are typically very dry due to little precipitation and the high evaporation rates. Precipitation is greatest in December–January and in June. Near-surface soils are typically frozen during winter months.

The dry climate of the BG Zone is due in part to valley topography influences. Solar heating of valley slopes results in valley heating, relatively strong convection currents, and reduced precipitation onto valley slopes.

TABLE 3 Environmental characteristics of BG subzones in the Cariboo Forest Region

	BGxh3	BGxw2
Area (km^2)	269	627
Elevation range (m)	400–650	650–900
Climate		
Precipitation (mm)		
Mean annual	330	345
Mean summer	177	197
Mean winter	153	148
Mean annual snowfall (cm)	71	180
Temperature(°C)		
Mean annual	5.9	5.0
Mean - warmest month	19.0	17.3
Mean - coldest month	-10.6	-9.9
Frost-free days	182	169
Soils		
Zonal soils[a]	O.B	O.B
Zonal humus form[b]	RMu	RMu

[a]O.B = Orthic Brown Chernozem
[b]RMu = RhizoMull

Vegetation Native vegetation on zonal sites of the BG Zone is characterized by bunchgrasses, several low forbs and small grasses, scattered shrubs, and a crust of lichens, mosses, and cyanobacteria on soil surfaces. Bluebunch wheatgrass is the characteristic dominant grass of the climax vegetation and is present on most sites. Other common grasses include needle-and-thread grass, junegrass, Sandberg's bluegrass, spreading needlegrass, sand dropseed, and porcupine grass. Compact selaginella, yarrow, cut-leaved daisy, Hoelboell's rockcress, large-fruited desert parsley, pasture sage, and low pussytoes are common forbs. Big sagebrush is common and often dominates the vegetation at low elevations of the zone. Rabbit-brush and common juniper are also common, although rarely dominant, shrubs.

Riparian communities are relatively small and infrequent in the BG Zone but are characterized by a rich variety of tall shrub and herbaceous species. Douglas-fir is present on many of these sites. Wetlands are generally uncommon in the BG and occur most frequently at upper elevations of the zone on the low-relief terrain of the plateau.

Vegetation of the BG Zone has been modified nearly everywhere by domestic grazing. This has resulted in an increase of weedy species (both native and non-native), a significant decrease in the abundance of climax bunchgrass species, and increased abundance of pussytoes, pasture sage, line-leaved fleabane, and other grazing increasers. In addition, the soil litter layers and the crust of lichens/mosses/cyanobacteria have been significantly reduced. However, non-native weeds are not as common in the Cariboo Forest Region grasslands as they are in grasslands of southern British Columbia.

Soils Soils on zonal sites of the BG Zone are primarily Brown Chernozems developed on loamy glacial till derived primarily from basalt rocks. In most areas, a veneer of stone-free silt and fine sand, 10–50 cm thick, is present over the glacial till. This veneer is generally assumed to be wind-deposited but may partly result from soil faunal activity. The veneer contrasts sharply with the gravelly till on which it lies. An organically enriched Ah horizon is typically 10–20 cm thick and a carbonate layer is usually present within 20–50 cm of the surface. Humus forms are primarily thin Rhizomulls.

Subzones and Variants of the BG Zone in the Cariboo Forest Region

Two subzones of the BG Zone, each represented by a single variant, are present in the Cariboo Forest Region:

BGxh - Very Dry Hot BG Subzone
  BGxh3 - Fraser Variant
BGxw - Very Dry Warm BG Subzone
  BGxw2 - Alkali Variant

These two subzones correspond approximately to the lower and middle grasslands of the Cariboo Forest Region described by Nicholson and Hamilton (1984).

BGxh3 Variant The BGxh3 includes the driest, warmest, and lowest-elevation grasslands of the Region. It is a relatively small biogeoclimatic unit (269 km^2) that occurs primarily below 650 m on lower slopes and terraces of the Fraser River valley. Climax vegetation on zonal sites is distinguished by prominent big sagebrush and a herb layer dominated by bluebunch wheatgrass and junegrass. Relatively few vascular species are present and a crust of lichens, mosses, and cyanobacteria comprises a significant proportion of the soil cover in climax vegetation. This variant is not present in any other Region, although the BGxh subzone occurs in the Kamloops and Nelson regions.

BGxw2 Variant The BGxw2 occurs at elevations above the BGxh3 (approximately 650–900 m) on middle and upper slopes of the Fraser and lower Chilcotin river valleys. It is slightly larger (627 km^2) than the BGxh3 and is distinguished from the BGxh3 by having little or no big sagebrush, a greater total vascular plant cover, and a greater diversity of vascular plant species on zonal sites. In addition, porcupine grass is common on moist lower slopes and in shallow depressions. On zonal sites, the vegetation is dominated by bluebunch wheatgrass, needle-and-thread grass, junegrass, umber pussytoes, and a well-developed lichen crust dominated by Cladonia lichens. Douglas-fir forests are common on lower slopes, north aspects, and in draws within the BGxw2.

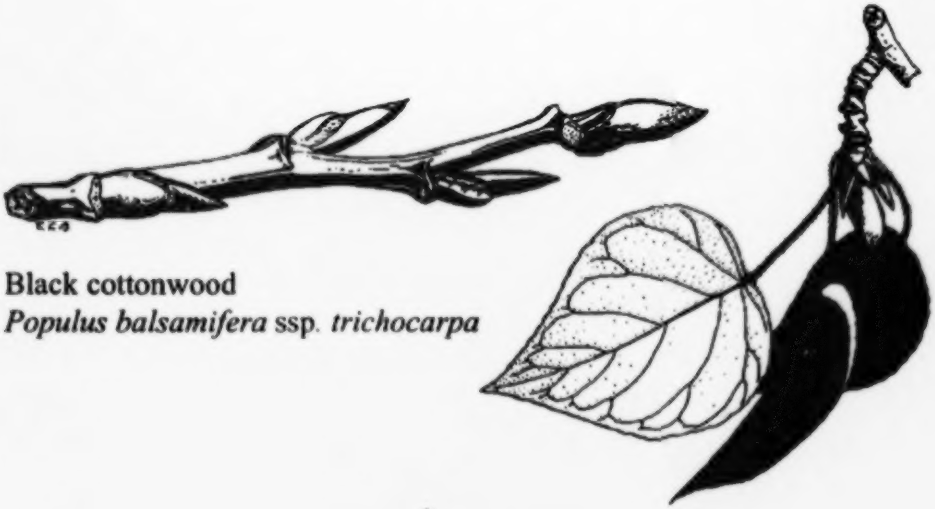
CWH
Coastal Western Hemlock Zone

Overview

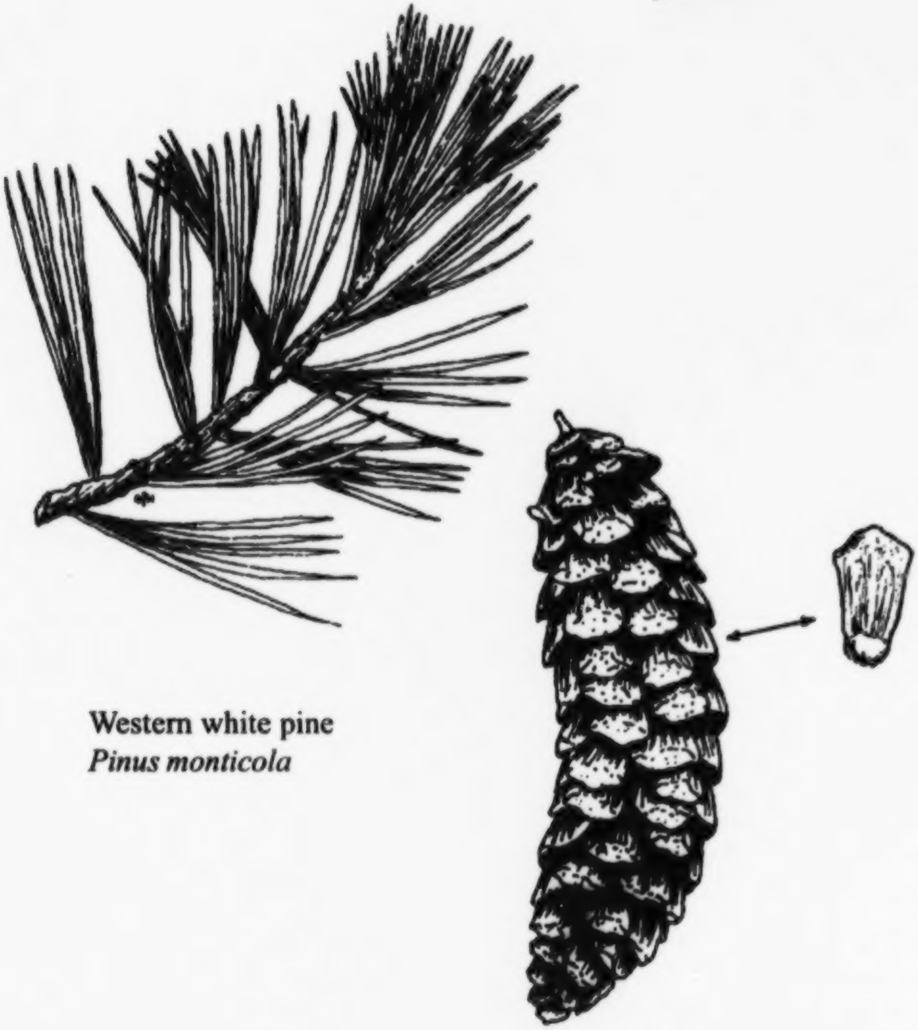
The Coastal Western Hemlock (CWH) Zone in Britich Columbia occurs primarily in the coastal environments of the Vancouver and Prince Rupert forest regions. It has a very small total area (283 km^2) within the Cariboo Forest Region in the lower Mosley Creek valley, the Homathko River valley downstream of about Mosley Creek, and at the southern tip of Chilko Lake.

The portion of the CWH Zone within the Cariboo Forest Region is transitional to Interior climates. It is distinguished by the presence of western hemlock, western redcedar, western white pine, amabilis fir, and other coastal species including red huckleberry, red alder, and white-veined wintergreen. Species found in Interior forests, such as red-stemmed feathermoss, are also common. Similar to other submaritime CWH forests, the understory vegetation is sparse. Common species are black huckleberry, falsebox, prince's pine, false azalea, queen's cup, and bunchberry.

The CWH in the Cariboo Forest Region has not been sufficiently inventoried to assess subzone boundaries or site series representation. However, based on surveys in adjacent areas of the Vancouver Forest Region, two variants, the CWHds1 (Dry Submaritime Subzone, Southern Variant) and CWHms1 (Moist Submaritime Subzone, Southern Variant) may be present in the Cariboo Forest Region. Both would be at the Interior limits of their extent and are much more extensive in the coastal environments of the Vancouver Forest Region. In the Vancouver Forest Region, the CWHds1 occurs in valley bottoms and the CWHms1 at higher elevations below the Mountain Hemlock Zone. In the Cariboo Forest Region, the CWHds1 may occur from valley bottom to the Mountain Hemlock Zone or a band of the CWHms1 may occur between the upper elevations of the CWHds1 and lower elevations of the Mountain Hemlock Zone.



Black cottonwood
Populus balsamifera ssp. *trichocarpa*



Western white pine
Pinus monticola

ESSF
Engelmann Spruce–Subalpine Fir Zone

Overview

Location and Distinguishing Features The ESSF Zone includes the highest-elevation forests in the southern three-quarters of the Interior of British Columbia (Coupé *et al.* 1991). In the Cariboo Forest Region, it occurs extensively in the Quesnel Highland and Coast Mountains and locally on the high summits within the Fraser Plateau such as the Rainbow, Ilgachuz, Itcha, Chilcotin, and Camelsfoot ranges and Vedan and Windy mountains. Elevations of the ESSF are 1200–1800 m in the Quesnel Highland and wetter parts of the Fraser Plateau and 1650–2100 m in the Coast Mountains and drier parts of the Fraser Plateau. The ESSF in the Cariboo Forest Region occurs immediately above the ICHwk, SBSwk, SBSmc, MSxv, MSxk, MSdc, and MSdv.

The ESSF Zone is distinguished from other forested zones in the Cariboo Forest Region by the following set of characteristics:
1) it lies immediately below the Alpine Tundra Zone;
2) climax forests are dominated by Engelmann spruce and subalpine fir; mountain hemlock is absent;
3) one or more of the following species are present on zonal sites:
   - white-flowered rhododendron
   - Sitka valerian
   - bracted lousewort
   - mountain sagewort
   - arrow-leaved groundsel

A transition, termed "parkland" and characterized by patches of erect trees and krummholz within a matrix of subalpine meadows, occurs between the closed ESSF forests and the virtually treeless alpine. This transition may extend over only a few metres or more than 100 m of elevation. For purposes of biogeoclimatic mapping and classification, this transition has been included as part of the AT Zone.

Climate Growing seasons in the ESSF are cool and short, while winters are long and cold (Coupé *et al.* 1991). The Quesnel Highland / Cariboo Mountains area is the wettest, snowiest portion of the zone in the Cariboo Forest Region. Mean annual temperatures in this area range from about -1.0 to -0.1 °C (Table 4). Frost can occur in all months.

Mean annual precipitation averages about 1100 mm, of which about 60% falls during the winter period from October to April. Mean annual snowfall averages about 660 cm, and maximum snowpack depths are typically 180–300 cm. The snowpack generally begins to accumulate in mid-October and builds quickly before the ground freezes deeply. As a result, soils are seldom frozen in mid-winter. Snow generally lies on the ground until late May or early June.

TABLE 4 Environmental characteristics of ESSF subzones and variants in the Cariboo Forest Region[a]

	ESSFxv	ESSFdc2	ESSFwk1	ESSFwc3
Area (km^2)	3802	196	3610	2183
Elevation range (m)	1650–2100	1400–1900	1200–1500	1500–1800
Climate	no data			
Precipitation (mm)				
Mean annual		839.0	1044.0	1408.0
Mean summer			431.0	516.0
Mean winter			619.0	871.0
Mean annual snowfall (cm)			538.0	782.0
Temperature(°C)				
Mean annual		-0.2	-0.1	-1.0
Mean - warmest month			9.0	8.6
Mean - coldest month			-11.0	-12.6
Frost-free days			121.0	140.0
Soils				
Zonal soils[b]	O.HF.P.	O.HF.P. E.Dy.B.	O.HF.P.	O.HF.P.
Zonal humus form[c]	HR	HR	HR	HR

[a] The ESSFxc and ESSFmv1 are not included here due to their very small extent within the Cariboo Forest Region; refer to site identification guides for the Kamloops (ESSFxc) and Prince George (ESSFmv1) forest regions. The ESSFxv includes the ESSFxv1 and the ESSFxv2.

[b] O.HF.P. = Orthic Humo-Ferric Podzol; E.Dy.B. = Eluviated Dystric Brunisol

[c] HR = HemiMor

No climatic data are available for the ESSF Zone on the leeward side of the Coast Mountains or on the western Fraser Plateau. However, vegetation and soils of this part of the ESSF as well as data from the upper elevations of the MSxv clearly indicate that the climate is significantly drier and colder than that of the Quesnel Highland portion of the ESSF. Frost probably occurs in all months, and snowfall is relatively light. Maximum snowpacks have been observed to be generally less than 150 cm and the ground to be frozen in areas of relatively light snowpack.

Vegetation The ESSF landscape has a nearly continuous cover of mature to old coniferous forests, especially at low and middle elevations of the zone. The continuity of these forests is increasingly broken by wet meadows, shrublands, avalanche slopes, and alpine tundra communities at upper elevations. Wildfires have been relatively infrequent, especially in the Quesnel Highland portion of the ESSF, and young forests are much less common than in most other biogeoclimatic units of the Region. Few deciduous trees are present in the ESSF.

Climax tree species of the ESSF Zone are Engelmann spruce and subalpine fir. In the Quesnel Highland and other relatively high-precipitation parts of the ESSF (ESSFwk, ESSFwc, ESSFmv), these species dominate the landscape in multi-storied, all-aged stands. At low to middle elevations of the zone in this area (ESSFwk1), Engelmann spruce typically dominates the canopy and comprises most of the largest trees, while subalpine fir is the most abundant species in the subcanopy and understory due to its less exacting seedbed requirements and greater shade tolerance. At upper elevations of the zone (ESSFwc3), however, subalpine fir often dominates the canopy as well as the understory. Lodgepole pine is a relatively minor component of the older forest, found occasionally on dry ridges, steep south-facing slopes, and very coarse-textured soils. Following wildfire, spruce typically dominates the young forest, although pine may also be present.

In the Coast Mountains and dry, western portions of the Fraser Plateau, lodgepole pine forests dominate the ESSF landscape (ESSFxv). The dominance of pine, a seral species, results from the greater frequency of wildfires in this portion of the ESSF and also from the slow growth of trees and the resulting long duration of seral stages in this very cold, very dry climate. Many of the pine stands have existed for more than 200 years since establishment. Tree regeneration is predominantly subalpine fir and Engelmann spruce. Whitebark pine, which is only sporadically present in the Quesnel Highland, is common at upper elevations (>1850 m) of the ESSF in the Coast Mountains.

Understory vegetation on zonal sites in the Quesnel Highland includes a relatively well-developed shrub layer (white-flowered rhododendron, black huckleberry, and oval-leaved blueberry), ferns (oak fern, lady fern, spiny wood fern) and several other forbs, and mosses. In the Coast Mountains, the undergrowth is less productive and consists mostly of low-growing plants including dwarf shrubs (crowberry, grouseberry, and dwarf blueberry) and a variety of herbaceous species, mosses, and lichens.

Soils Soils of the ESSF Zone in the Cariboo Forest Region are developed primarily on morainal deposits (till). These materials are derived from a wide variety of rock types including basalt, schist, limestone, quartzite, phyllite, and siltstone. Schistose metamorphic rocks are predominant in the Quesnel Highland, basalt is predominant on the Fraser Plateau, sedimentary and volcanic rocks occur in the Chilcotin Ranges, and granitic rocks are prevalent in the Coast Mountains. Calcareous bedrock, including limestone, occurs in the Maeford Lake area and Marble Range but is not common elsewhere.

Fluvial and glaciofluvial materials occur locally in the ESSF but are less common than in the lower-elevation zones such as the ICH. Organic deposits occupy a very small proportion of the landscape. On steeper slopes, morainal deposits have often moved downslope due to gravity and are considered colluvium.

Soils on zonal sites of the Cariboo ESSF are predominantly Orthic Humo-Ferric Podzols with a relatively thin (2–7 cm) forest floor. In areas of dark-coloured parent rocks such as shale, these podzols may be dark-coloured. Brunisols occur locally on dry, coarse-textured materials, especially in drier parts of the ESSF such as in the Chilcotin Ranges and leeward side of the Coast Mountains. Seepage volumes are generally high in the Quesnel Highland, and soils on lower slopes are often mottled and moist to wet throughout the growing season. In the Chilcotin Ranges and Coast Mountains, seepage volumes are smaller (except locally in diffuse drainage courses occupied by shrub and graminoid vegetation). In all parts of the ESSF, but especially on wet sites, soils are cool to cold throughout the growing season. Low soil temperatures, more often than soil moisture deficits, limit plant production.

Subzones and Variants of the ESSF Zone in the Cariboo Forest Region

Six biogeoclimatic subzones of the ESSF Zone occur within the Cariboo Forest Region. Four are represented by a single variant and one by two variants. Three subzones (ESSFwk, ESSFwc, ESSFxv) comprise most of the zone within the Region. Some selected species in these three subzones are listed in Table 5.

ESSFxv - Very Dry Very Cold ESSF Subzone
  ESSFxv1 - West Chilcotin Variant
  ESSFxv2 - Big Creek Variant
ESSFxc - Very Dry Cold ESSF Subzone
ESSFdc - Dry Cold ESSF Subzone
  ESSFdc2 - Thompson Variant
ESSFmv - Moist Very Cold ESSF Subzone
  ESSFmv1 - Nechako Variant
ESSFwk - Wet Cool ESSF Subzone
  ESSFwk1 - Cariboo Variant
ESSFwc - Wet Cold ESSF Subzone
  ESSFwc3 - Cariboo Variant

ESSFxv Subzone The ESSFxv is the most extensive subzone (3802 km^2) of the ESSF in the Cariboo Forest Region. It includes all ESSF landscapes of the Region in the Pacific Ranges, Chilcotin Ranges, Camelsfoot Range, and Itcha and Ilgachuz mountains. It also occurs on isolated heights-of-land north and east of the Coast Mountains such as Vedan, Wales, and Satah mountains. Elevations are generally 1650–2100 m. On the Fraser Plateau and portions of Coast Mountains bordering the Fraser Plateau, the ESSFxv lies above the MSxv. Further into the Coast Mountains, the ESSFxv lies above the MSdc and MSdv subzones.

The ESSFxv has a very cold, very dry climate. Although no climatic data are available, the vegetation indicates that the ESSFxv is probably the driest area of the ESSF in British Columbia. Due to relatively low humidity and clear skies, overnight radiation cooling is intense and frosts occur very frequently during the growing season.

Vegetation of the ESSFxv is distinguished from that of other ESSF units by the presence of grouseberry, black crowberry, and mountain sagewort and by abundant ground lichens (primarily *Cladonia* spp.). Feathermosses are uncommon. Lodgepole pine forests are the predominant vegetation of the ESSFxv landscape.

TABLE 5 ESSF vegetation table - zonal sites[a]

	Biogeoclimatic Unit	**ESSFxv1**	**ESSFxv2**	**ESSFwk1**	**ESSFwc3**	
Tree Layer	*Pinus albicaulis*	▮				whitebark pine
	Pinus contorta	▮▮▮▮▮	▮▮▮▮▮			lodgepole pine
	Abies lasiocarpa	▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	subalpine fir
	Picea engelmannii	▮	▮	▮▮▮▮▮	▮▮▮▮▮	Engelmann spruce
Shrub Layer	*Juniperus communis*	▮	▮▮▮			common juniper
	Shepherdia canadensis	▮	▮			soopolallie
	Vaccinium membranaceum	▮		▮▮▮	▮▮▮▮	black huckleberry
	Rhododendron albiflorum			▮▮▮▮	▮▮▮▮▮	white-flowered rhododendron
	Vaccinium ovalifolium			▮▮▮	▮	oval-leaved blueberry
	Ribes lacustre			▮▮▮	▮▮▮	black gooseberry
Herb Layer	*Vaccinium scoparium*	▮▮▮				grouseberry
	Arnica cordifolia	▮▮▮	▮▮▮			heart-leaved arnica
	Lupinus arcticus	▮▮▮	▮▮▮			arctic lupine
	Orthilia secunda	▮▮	▮	▮▮		one-sided wintergreen
	Aster foliaceus		▮▮▮			leafy aster
	Potentilla diversifolia		▮▮			diverse-leaved cinquefoil
	Pedicularis bracteosa		▮▮			bracted lousewort
	Vaccinium caespitosum	▮	▮▮▮			dwarf blueberry
	Cornus canadensis			▮▮▮		bunchberry
	Clintonia uniflora			▮▮▮	▮	queen's cup
	Tiarella trifoliata			▮▮▮	▮	three-leaved foamflower
	Gymnocarpium dryopteris			▮▮▮▮▮	▮▮▮	oak fern
	Lycopodium annotinum			▮▮▮	▮▮	stiff clubmoss
	Valeriana sitchensis			▮▮▮	▮▮▮▮	Sitka valerian
	Veratrum viride			▮▮▮	▮▮▮	Indian hellebore
	Streptopus roseus			▮▮▮	▮▮▮	rosy twistedstalk
	Tiarella unifoliata			▮	▮▮▮	one-leaved foamflower
	Mitella breweri				▮	Brewer's mitrewort
Moss Layer	*Peltigera* spp.	▮	▮▮▮			pelt lichens
	Cladonia spp.	▮▮▮	▮▮▮▮▮		▮	cladonia lichens
	Ptilidium spp.		▮▮			
	Cetraria spp.		▮			cetraria lichens
	Peltigera aphthosa	▮	▮▮▮	▮		freckle pelt
	Dicranum spp.	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	heron's-bill mosses
	Brachythecium spp.	▮	▮▮▮	▮▮▮	▮▮▮▮	ragged mosses
	Ptilium crista-castrensis			▮▮▮▮▮		knight's plume
	Pleurozium schreberi			▮▮▮▮▮	▮▮▮	red-stemmed feathermoss
	Mnium spp.			▮▮▮▮	▮▮▮	leafy mosses
	Barbilophozia spp.			▮▮▮	▮▮▮▮	leafy liverworts
	Rhytidiopsis robusta				▮▮▮	pipecleaner moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%;
▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

ESSFxc, ESSFdc2, and ESSFmv1 not included due to no data from Cariboo Forest Region.

Although these are seral forests, eventually replaced by Engelmann spruce and subalpine fir forests, they are long-lived seral stages due to slow tree growth in this very cold, very dry climate. Spruce and subalpine fir regeneration is common in the understory. The undergrowth vegetation is typically dominated by dwarf shrubs, low- to medium-height forbs, mosses, and lichens. Common shrub or semi-shrub species are black crowberry, grouseberry, and mountain-heather. In contrast to other ESSF units in the Region except the ESSFxc, white-flowered rhododendron occurs primarily on north-facing slopes and is seldom abundant.

ESSFxv1 Variant The ESSFxv1 is the most extensive of the two ESSFxv variants, extending from the east side of Taseko Lakes west to Tweedsmuir Park on the Pacific Ranges. It also includes the ESSF in the Itcha and Ilgachuz mountains. Precipitation amounts are estimated to be somewhat greater than in the ESSFxv2 and are probably highest in western parts of the variant. The terrain is more rugged, the summits higher, and slopes generally steeper than in the ESSFxv2. The vegetation on zonal sites has more abundant subalpine fir in both the canopy and regeneration layers. The herbaceous layer also has more abundant grouseberry.

ESSFxv2 Variant The ESSFxv2 extends from the east slopes of Anvil Mountain eastward to the east slopes of the Camelsfoot Range, overlooking the Fraser River valley. It includes the highest forested elevations of the Chilcotin and Camelsfoot ranges. Precipitation is probably less in general than in the ESSFxv1. The terrain is largely rounded summits with many slopes of gentle to moderate gradients. Mature forests are dominated by lodgepole pine with relatively little tree regeneration. Subalpine fir is much less abundant than in the ESSFxv1, and stands are more often single-layered.

ESSFxc Subzone The ESSFxc occurs primarily in the Kamloops Forest Region (Lloyd *et al.* 1990) and has a very small area (115 km^2) within the Cariboo Forest Region on the Marble Range, west of Clinton. Here and in the Kamloops Forest Region it occurs above the MSxk Subzone. Vegetation similarities to the ESSFxv include the presence of grouseberry and kinnikinnick and the relatively sparse occurrence of white-flowered rhododendron.

Compared to the ESSFxv, however, the forests are dominated primarily by Engelmann spruce and subalpine fir, feathermosses are more prevalent, ground lichens are less abundant, and pinegrass is present on south-facing slopes. Douglas-fir is also present within the ESSFxc on the Marble Range.

ESSFdc2 Variant The ESSFdc2 occurs primarily on the Thompson Plateau in the Kamloops Forest Region (Lloyd *et al.* 1990) but has a small extent along the southeast border of the Cariboo Forest Region in the Bowers Lake to Bonaparte Lake area. Here, it occurs on relatively low, rounded summits above the SBSmc and SBSmm, at elevations of 1400–1900 m.

The ESSFdc2 has a climate drier than that of the ESSFwk1 and ESSFwc3 but wetter than that of the ESSFxc or ESSFxv. Mean annual temperatures are similar to the ESSFwk1.

Vegetation of the ESSFdc2 is distinguished from other ESSF units of the Region by the presence of grouseberry and abundant white-flowered rhododendron and by the absence of black crowberry. Seral stands of lodgepole pine cover the ESSFdc2 landscape in the Cariboo Forest Region. Subalpine fir and Engelmann spruce are common in the understory. The shrubby undergrowth includes white-flowered rhododendron, black huckleberry, and grouseberry.

ESSFmv1 Variant The ESSFmv1 occurs primarily in the Prince George Forest Region and has only a very small extent (12 km^2) within the Cariboo Forest Region. It is present on the relatively low, rounded summits in the Blackwater–Nazko area west of Pantage Lake at elevations above 1400 m. The climate is drier than that of the ESSFwk and ESSFwc but wetter than all other ESSF climates in the Region. Refer to DeLong *et al.*(1993) for a description of this variant.

ESSFwk1 Variant The ESSFwk1 includes the largest portion of the ESSF Zone (3610 km^2) within the Quesnel Highland. It occurs between 1200 and 1500 m elevation from the northern limits of the Quesnel Highland in the Prince George Forest Region south to about Canim and Mahood lakes. South of the Cariboo River, it occurs above the ICHwk, while to the north it occurs above the SBSwk. Throughout its range, it occurs below the ESSFwc3. Topography of the ESSFwk1 ranges from hilly on the western edge of the Quesnel Highland to rugged mountainous to the west, in the Cariboo Mountains.

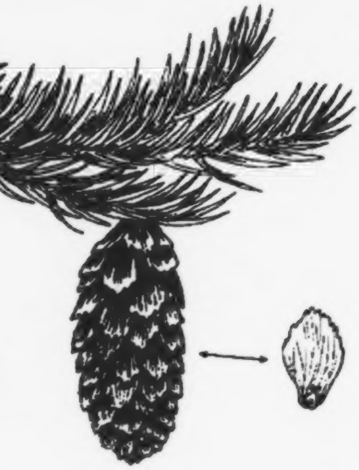
The ESSFwk1 is the wettest biogeoclimatic unit of the Cariboo Forest Region (mean annual precipitation 1044 mm) with the exception of the ESSFwc3 and associated alpine tundra areas. About 40% of the precipitation falls during the growing season from May to September and about 50% falls as snow. High-precipitation periods are typically early winter and early summer. Thunderstorms contribute significant precipitation throughout the summer season. Maximum snowpack in mid-winter is generally about 2–2.5 m and snow usually lies on the ground from mid-November to late May or early June. Although summers are cool and winters are cold, growing seasons are probably not as cold as those of the ESSFwc3 or ESSFxv, where elevations are higher and rates of night-time radiation cooling are greater. Soils are generally not frozen during winter months due to the insulating snow cover, but often do not warm significantly during the summer months, especially where soils are moist and insulated by a forest floor. On moist and wet sites, summer soil temperatures seldom exceed 10°C. Moisture deficits are apparently uncommon in the ESSFwk1.

Vegetation of the ESSFwk1 is distinguished from that of other ESSF units in the Cariboo Forest Region by a vigorous and diverse herbaceous undergrowth, which includes oak fern, three-leaved foamflower, rosy twistedstalk, and abundant feathermosses. In contrast to drier subzones (ESSFxv, ESSFxc), it does not have grouseberry or abundant ground lichens. Mature and old forests of Engelmann spruce and subalpine fir blanket the ESSFwk1 landscape. Stands are typically multi-layered and comprised of stems of all size and age classes. Engelmann spruce are typically the largest and oldest trees in the stand and dominate the upper canopy. Subalpine fir is the most abundant species in the lower canopy and in the regeneration layers due to its less exacting seedbed requirements and greater shade tolerance. Spruce regeneration occurs on raised sites, especially where mineral soil is exposed, and in canopy openings. Undergrowth vegetation in the ESSFwk1 is dominated by ericaceous shrubs, ferns, low forbs, and mosses.

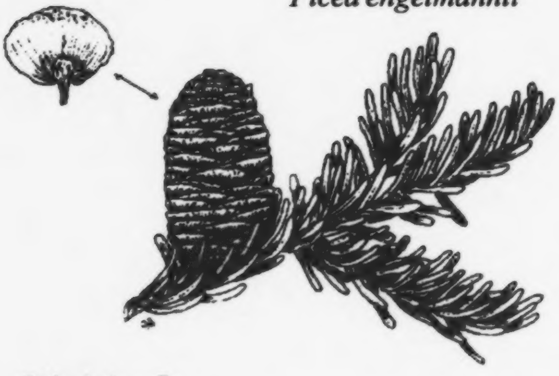
ESSFwc3 Variant The ESSFwc3 includes the highest-elevation forests of the Quesnel Highland. It occurs above the ESSFwk1 and below the Alpine Tundra Zone at elevations of 1500–1800 m.

The ESSFwc3 is the wettest biogeoclimatic unit of the Cariboo Forest Region, with the possible exception of alpine areas at higher elevations. Recorded mean annual precipitation is more than 50% greater than that of the ICHwk. Precipitation patterns are similar to those of the ESSFwk1; about 55% falls as snow, resulting in a peak snowpack of 2–3 m. Snow lies on the ground from mid-November until early June. Growing seasons are cool and winters are cold. Frost occurs in all months, although probably not as frequently as in the ESSFxv.

The ESSFwc3 natural landscape is covered primarily by mature and old forests of Engelmann spruce and subalpine fir. In contrast to the ESSFwk1, these forests are often dominated by subalpine fir and have a more open canopy, and trees often have a more clumped distribution. At upper elevations of the ESSFwc3, the forest is increasingly interrupted by small wet meadows and shrublands. The undergrowth vegetation on mesic sites is characterized by a very dense shrub layer, consisting primarily of white-flowered rhododendron. Ground cover of herbaceous species is often sparse but includes several low forbs such as three-leaved foamflower, five-leaved bramble, and oak fern. Feathermosses are less common and other mosses such as *Brachythecium* spp. and *Dicranum* spp. are more common than in the ESSFwk1. In contrast to the ESSFdc2 and ESSFxv, grouseberry is not present in the ESSFwc3.



Engelmann spruce
Picea engelmannii



Subalpine fir
Abies lasiocarpa

ICH
Interior Cedar–Hemlock Zone

Overview

Location and Distinguishing Features The ICH Zone is distinguished from all other zones, except the CWH, by climax forests of western redcedar and/or western hemlock on zonal sites. Both species are most often present but, in some subzones such as the ICHmk, one or the other is absent. The ICH has many similarities to the CWH Zone, where western redcedar and western hemlock are also climax species, but is distinguished from it by:

1) presence of hybrid white spruce and subalpine fir;
2) absence of Sitka spruce and amabilis fir;
3) presence of several shrub, herbaceous, and moss species (Pojar and Meidinger 1991).

The ICH Zone occurs at low to middle elevations in the "interior wetbelt" of southeastern British Columbia and in the Nass Basin area just east of the Coast Mountains in west-central British Columbia (Ketcheson *et al.* 1991). In the Cariboo Forest Region, it occurs in the wet climates of the Cariboo Mountains and Quesnel Highland and easternmost portions of the Fraser Plateau, adjacent to the Quesnel Highland. It extends from the southeastern portion of the Region, south of Canim Lake to as far north as the Cariboo River valley. The largest areas of the ICH in the Region are in the Quesnel Lake – Horsefly Lake area, Cariboo River valley, the upper McKusky and McKinley creeks area, and north of Canim Lake. North of the Cariboo River valley, where the climate becomes more boreal-like, the ICH is replaced by the SBSmw and SBSwk on similar physiographic positions.

The ICH Zone extends from valley bottoms to elevations of about 1250 m in the Quesnel Highland. At its upper elevations, it borders the ESSFwk. On its western edge, where the climate becomes too dry for redcedar and western hemlock forests, the ICH borders the SBSdw (Dry Warm Sub-Boreal Spruce) Subzone.

Climate The ICH Zone has cool, wet winters and warm, moist to dry summers (Table 6). Annual precipitation is among the highest in the Region, exceeded only by that of the ESSF and associated alpine and by portions of the SBSwk1. About 40% of the annual precipitation falls during the summer months, from May through September. Peak precipitation periods are early winter and early summer.

TABLE 6 Environmental characteristics of ICH subzones and variants in the Cariboo Forest Region

	ICHdk	ICHmk3	ICHwk2	ICHwk4
Area (km^2)	425	1123	1726	607
Elevation range (m)	900–1250	780–1250	725–1250	800–1250
Climate	no data			no data
Precipitation (mm)				
Mean annual		722	842	
Mean summer		333	354	
Mean winter		389	490	
Mean annual Snowfall (cm)		214	262	
Temperature(°C)				
Mean annual		4.2	4.0	
Mean - warmest month		15.0	15.1	
Mean - coldest month		-9.3	-10.0	
Frost-free days		166	165	
Soils				
Zonal soils[a]	Br.G.L.	Br.G.L. (O.HF.P.)	O.HF.P.	O.HF.P.
Zonal humus form[b]	HR (RM)	HR (RM)	HR, RM	HR, RM

[a] Br.G.L. = Brunisolic Gray Luvisol; O.HF.P. = Orthic Humo-Ferric Podzol
[b] HR = HemiMor; RM = MorModer
Note: ICHmw3 not included due to very small area (32 km^2) in Cariboo Forest Region.

Snowfall accounts for about 30–35% of the annual precipitation and results in maximum snowpacks of about 1.5 m on plateau areas and 1.5–2.0 m at upper elevations of the zone in the Quesnel Highland. Mean annual temperatures are among the warmest in the Cariboo Forest Region and are exceeded only by those of the Bunchgrass Zone, portions of the Interior Douglas-fir Zone, and warmest subzones of the Sub-Boreal Spruce Zone. Growing-season frosts are less common in the ICH than in the SBS or IDF zones due to higher humidity and cloud cover, resulting in reduced overnight radiation cooling.

As a result of the relatively moist, warm climate, the ICH is the most productive zone for trees in the Cariboo Forest Region.

Vegetation The natural landscapes of the ICH Zone are dominated by mature and old forests of western redcedar, western hemlock, hybrid white spruce, subalpine fir, and Douglas-fir. Climax species on zonal sites are western hemlock and western redcedar, except on western, plateau portions of the zone where hemlock is absent. Here, climax species include western redcedar and subalpine fir. Spruce and subalpine fir are climax species on cold air accumulation sites such as lower slopes and the floor of the Cariboo River valley.

Douglas-fir is the principal seral tree species of the Cariboo Forest Region ICH Zone and typically dominates young and mature stands following wildfire. In the drier, plateau portions of the ICH Zone (ICHmk and ICHdk), where wildfires were moderately common, Douglas-fir stands, with an understory of redcedar, subalpine fir, and some western hemlock, cover much of the ICH landscape. In the wetter mountainous portion of the ICH (ICHwk), where wildfires were uncommon, few Douglas-fir stands are present. Even here, however, long-lived Douglas-fir trees are often present as remnants of an earlier seral stand. Another seral tree species is black cottonwood, which is often present on moist sites. In the relatively dry, plateau portions of the zone, lodgepole pine is common on mesic and drier sites. In the wet, mountainous portion of the ICH, lodgepole pine occurs primarily on coarse-textured soils and dry ridgetops.

The understory vegetation in mature and old forests on zonal sites is characterized by relatively dense tree regeneration, a sparse to moderate cover of shrubs and herbs, and relatively well-developed moss layer. In old ICH forests, redcedar regenerates primarily by layering. Hemlock seedlings occur primarily on rotting logs on the forest floor. The cover of shrubs and herbaceous species is greatest in dry portions of the zone where the tree canopy is more open. In wetter parts of the ICH, cover is greatest in canopy gaps and relatively sparse under a closed canopy. Common shrub species are black huckleberry, oval-leaved blueberry, devil's club, falsebox, thimbleberry, and black gooseberry.

Common herbs include three-leaved foamflower, oak fern, five-leaved bramble, and one-sided wintergreen. Most herbaceous species are low-growing. Principal moss species include red-stemmed feathermoss, stepmoss, knight's plume, and electrified cat's-tail moss.

Soils Soils of the ICH are developed primarily on basal moraine (glacial till) deposits. These are derived from a variety of rock types including basalt, schist, limestone, quartzite, phyllite, and siltstone, but due to widespread mixing of rock types, none have a dominant influence on soil development. Soils derived from predominantly volcanic rocks tend to have a loamy to clayey texture; those derived from schists and quartzites tend to be loamy to sandy; and those derived from fine-texture sedimentary rocks tend to be loamy to clayey (Lord 1984).

Fluvial and glaciofluvial deposits are common in the ICH. They tend to be gravelly and sandy and occur as terraces, eskers, kames, and outwash plains. Glaciolacustrine deposits occur locally on valley slopes above the north arm of Quesnel Lake.

Soils on zonal sites range from Brunisolic Gray Luvisols in the drier, plateau portion of the zone to Orthic Humo-Ferric Podzols in the wetter and higher-elevation portions of the zone. Brunisols occur on dry ridge crests and coarse-textured deposits. Gleysols are common on poorly drained deposits. Seepage volumes in the ICH are relatively high, and soils on lower slopes are often mottled.

Subzones and Variants of the ICH Zone in the Cariboo Forest Region

Four ICH subzones, one with two variants and two represented by a single variant, occur in the Cariboo Forest Region:

- ICHdk - Dry Cool Subzone
- ICHmk - Moist Cool Subzone
  - ICHmk3 - Horsefly Variant
- ICHmw - Moist Wet Subzone
  - ICHmw3 - Thompson Variant
- ICHwk - Wet Cool Subzone
  - ICHwk2 - Quesnel Variant
  - ICHwk4 - Cariboo Variant

ICHdk Subzone The ICHdk is a small subzone (425 km^2) that occurs just north of Canim Lake on the southeastern Fraser Plateau and the southwestern-most portion of the Quesnel Highland. It occurs at elevations between about 900 and 1250 m on a hilly to low mountainous landscape that rises from Canim Lake northward toward the Quesnel Highland. At lower elevations, it borders the IDFmw2, while at higher elevations it borders the ICHmk3 and the ESSFwk1. The ICHdk also has a very small area in the adjacent Kamloops Forest Region, just north of Mahood Lake.

The ICHdk is the driest ICH subzone in the Cariboo Forest Region and one of the driest in British Columbia. Although no climate data are available for this subzone, vegetation and soils suggest that precipitation amounts are only slightly greater than, and temperatures similar to, those of the SBSdw1.

Vegetation of the ICHdk is transitional between the SBSdw1 and the ICHmk3 and distinguished from other ICH subzones by relatively dry-climate shrubs such as saskatoon and soopolallie and the prevalence of lodgepole pine forests (Table 7). Climax tree species on zonal sites are western redcedar and subalpine fir, but, due to frequent wildfires, climax forests are uncommon. Douglas-fir and lodgepole pine forests cover most of the landscape. These forests often include scattered western redcedar, subalpine fir, and hybrid white spruce trees in the canopy and abundant redcedar and subalpine fir in the understory. Trembling aspen is also common. Western hemlock is uncommon.

Mature forests on zonal sites typically have a floristically rich and well-developed shrub and herbaceous undergrowth. Common shrubs include falsebox, black huckleberry, thimbleberry, saskatoon, and red-osier dogwood. The herbaceous layer is nearly continuous and includes wild sarsaparilla, twinflower, bunchberry, prince's pine, trailing raspberry, and clasping twistedstalk. Moss cover is also well developed but often obscured by herbaceous vegetation. Principal species are red-stemmed feathermoss and knight's plume.

ICHmk3 Variant The ICHmk3 in the Cariboo Forest Region occurs primarily on the Fraser Plateau, west of Quesnel Lake and along the western third of Horsefly Lake. A smaller portion of the variant occurs in the western Quesnel Highland in the McKinley Creek drainage, including McKinley, Elbow, and Gotchen lakes, and in the Hendrix Creek and Deception Creek valleys. An outlier of the ICHmk3 occurs near Spectacle Lake in Bowron Provincial Park. The variant occurs primarily on gently rolling plateau topography, except in the Hendrix and Deception creek valleys and near Spectacle Lake, where it occupies valley bottoms between low mountains. The ICHmk3 is primarily a transition between the SBSdw1 on plateau landscapes and the wetter ICHwk2 of the more rugged Quesnel Highland.

TABLE 7 ICH vegetation table - zonal sites[a]

	Biogeoclimatic Unit	ICH dk	ICH mk3	ICH wk2	ICH wk4	
Tree Layer	*Pseudotsuga menziesii*	▮▮▮▮▮	▮▮▮▮▮			Douglas-fir
	Abies lasiocarpa	▮	▮▮▮▮		▮▮▮	subalpine fir
	Picea engelmannii x glauca	▮▮▮▮	▮▮▮▮		▮▮▮▮	hybrid white spruce
	Thuja plicata	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	western redcedar
	Tsuga heterophylla			▮▮▮▮▮	▮▮▮▮▮	western hemlock
Shrub Layer	*Amelanchier alnifolia*	▮▮				saskatoon
	Lonicera involucrata	▮▮				black twinberry
	Pachistima myrsinites	▮▮▮▮▮	▮▮▮			falsebox
	Ribes lacustre	▮▮	▮		▮	black gooseberry
	Vaccinium membranaceum	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	black huckleberry
	Oplopanax horridus	▮	▮	▮▮▮	▮	devil's club
	Vaccinium ovalifolium			▮▮▮	▮▮▮	oval-leaved blueberry
Herb Layer	*Osmorhiza chilensis*	▮▮				mountain sweet-cicely
	Aralia nudicaulis	▮▮▮	▮▮▮			wild sarsaparilla
	Pyrola chlorantha	▮▮	▮▮▮			green wintergreen
	Mitella nuda		▮▮			common mitrewort
	Linnaea borealis	▮▮▮	▮▮▮	▮		twinflower
	Goodyera oblongifolia	▮▮	▮▮▮	▮▮▮		rattlesnake-plantain
	Clintonia uniflora	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	queen's cup
	Orthilia secunda	▮▮	▮▮▮	▮▮▮	▮▮▮	one-sided wintergreen
	Streptopus roseus	▮▮	▮	▮▮▮	▮▮▮	rosy twistedstalk
	Cornus canadensis	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	bunchberry
	Tiarella unifoliata	▮	▮▮▮	▮▮▮		one-leaved foamflower
	Gymnocarpium dryopteris		▮	▮▮▮▮	▮▮▮▮	oak fern
	Dryopteris expansa			▮▮▮		spiny wood fern
	Listera cordata		▮▮	▮▮	▮	heart-leaved twayblade
	Tiarella trifoliata	▮	▮▮	▮▮▮	▮▮▮	three-leaved foamflower
	Rubus pedatus	▮	▮▮▮	▮▮▮	▮▮▮▮	five-leaved bramble
Moss Layer	*Rhytidiadelphus triquetrus*	▮▮▮	▮▮▮▮	▮	▮▮▮	electrified cat's-tail moss
	Brachythecium spp.	▮▮▮	▮▮▮	▮▮▮		ragged mosses
	Mnium spp.	▮	▮▮▮	▮▮▮		leafy mosses
	Ptilium crista-castrensis	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	knight's plume
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Hylocomium splendens	▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	step moss
	Dicranum spp.	▮▮▮	▮▮▮	▮▮▮		heron's bill mosses
	Barbilophozia spp.		▮▮▮	▮		leafy liverworts
	Rhytidiopsis robusta			▮▮▮▮		pipecleaner moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

Note: ICHmw3 not included due to no data from Cariboo Forest Region.

The ICHmk3 climate is wetter than that of the ICHdk but significantly drier than most portions of the ICHwk. Mean annual precipitation (722 mm) is greater than that of the Sub-Boreal Spruce Zone in the Cariboo Forest Region, with the exception of the SBSwk1. About 45% of the annual precipitation falls during the summer months from May through September and about 30% falls as snow. Greatest rainfall months are June, July, and August and the greatest snowfall months are December through February. Peak snowpack is about 1.5 m. Mean annual temperatures in the ICHmk are similar to those of other ICH subzones in the Region and slightly warmer than those of SBS subzones in the Region.

The natural landscape of the ICHmk3 is blanketed by young, mature, and old forests of western redcedar, Douglas-fir, and lodgepole pine. Hybrid white spruce forests are common on moist valley bottom sites. Trembling aspen and paper birch forests occupy many recently burned sites. Due to past wildfires, young coniferous forests cover much of the landscape. On most sites, the young forests are dominated by Douglas-fir and/or lodgepole pine, with a dense understory of western redcedar and subalpine fir. The proportion of redcedar, subalpine fir, and spruce in the canopy generally increases as the stand ages, and old stands are typically dominated by western redcedar with scattered subalpine fir and spruce and an occasional Douglas-fir veteran. Western hemlock occurs infrequently in the understory. The undergrowth vegetation of mature forests on zonal sites includes a moderate cover of black huckleberry, falsebox, several low-growing herbs, and a nearly continuous cover of feathermosses.

ICHmw3 Variant The ICHmw3 has an extremely small area (32 km^2) within the Cariboo Forest Region, north of Mahood Lake. This variant occurs primarily in the Kamloops Forest Region. The Kamloops Forest Region guide to ecosystems (Lloyd *et al.* 1990) should be consulted for a description of this subzone and its site series.

ICHwk Subzone The ICHwk is the largest ICH subzone (2333 km^2) in the Cariboo Forest Region. It occurs in the mountainous topography of the Quesnel Highland, as far north as the Cariboo River valley and from valley bottoms to approximately 1250 m. Lowest elevations are lower than most areas of the Fraser Plateau. The largest area of the subzone is centred on Quesnel and upper Horsefly lakes but it also occurs in valleys of the Cariboo, Matthew, and Mitchell rivers and the McKusky.

Niagara, and Penfold creeks. Throughout its range, the ICHwk is bordered by the ESSFwk at higher elevations and the ICHmk3 on its western, plateau edge.

Climate of the ICHwk is very moist and warm relative to most other parts of the Cariboo Forest Region. Precipitation is among the highest in the Region, exceeded only by the ESSFwk, ESSFwc, and associated alpine areas and by parts of the SBSwk. Greatest precipitation months are December and January, and snow, which usually remains on the ground from mid-November to late April, accounts for about half of the total annual precipitation. Peak snowpack is typically 1.5–2.0 m. Nearly 50% of the total annual precipitation falls during the growing season. Mean annual temperatures are similar to those of the ICHmk and are generally warmer than subzones of the SBS, SBPS, MS, or ESSF zones. Valley bottoms away from the moderating influences of the large lakes accumulate cold air and have frequent summer frosts. Due to low radiation cooling, however, summer frost events are generally less frequent in the ICHwk than in most other forested subzones of the Region.

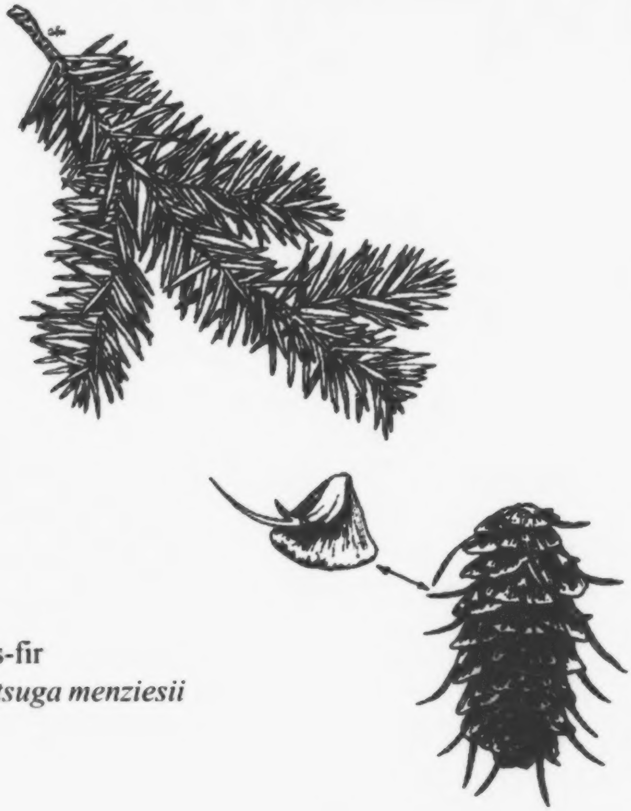
Stand-destroying wildfires have been relatively infrequent in the ICHwk. As a result, late seral and old forests cover most of the landscape. These forests are dominated by western hemlock and western redcedar and typically have minor components of subalpine fir and hybrid white spruce. Scattered old Douglas-fir trees are often present as veterans of an earlier seral stage. The understory has abundant redcedar, hemlock, and subalpine fir regeneration. Early and mid-seral forests are dominated primarily by Douglas-fir. Lodgepole pine stands occur on dry, thin soils and coarse-textured soils. Trembling aspen, paper birch, and black cottonwood are often widely scattered throughout Douglas-fir stands and dominate some moist, lower-slope sites. The undergrowth vegetation of late seral stands includes a sparse to moderate cover of shrubs (black huckleberry, oval-leaved blueberry, devil's club, falsebox), several low-growing herbaceous species, and a nearly continuous cover of mosses (primarily red-stemmed feathermoss, step moss, knight's plume, and electrified cat's-tail moss).

The ICHwk has the highest diversity of tree species and is the most productive subzone for trees in the Cariboo Forest Region.

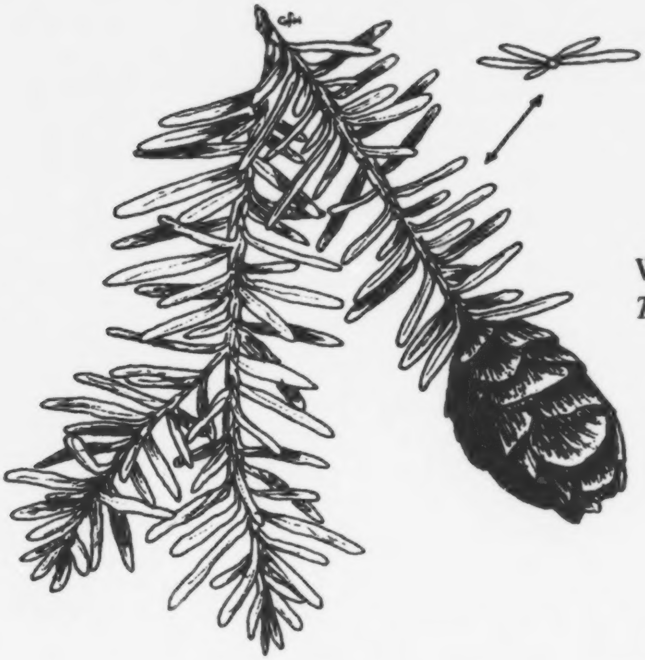
Two biogeoclimatic variants of the ICHwk are present in the Region.

The ICHwk2 (Quesnel) Variant occurs in the southern two-thirds of the ICHwk, south of the Cariboo and Matthew river valleys. It occupies the Quesnel–Horsefly lakes area, and the valleys of Niagara, Penfold, and McKusky creeks and Mitchell River. Spruce and subalpine fir stands are less common and the climate is slightly warmer, due to less cold air accumulation, than in the ICHwk4. The topography is hilly to mountainous with generally broader valleys than in the ICHwk4. It is the largest proportion of the ICHwk.

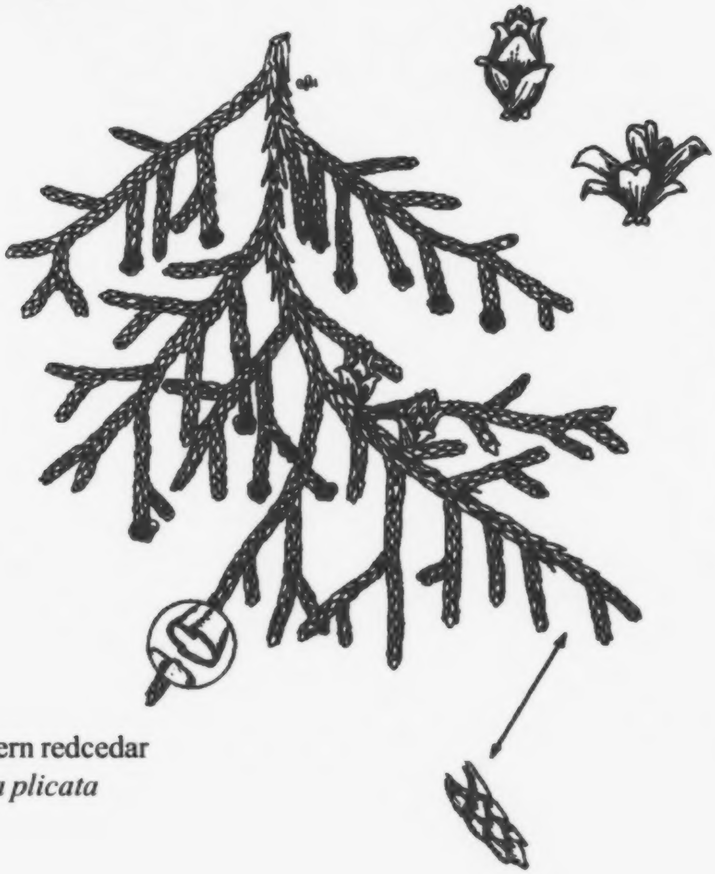
The ICHwk4 (Cariboo) Variant occurs in the valleys of the Cariboo River and Matthew River at the northern limits of the ICHwk. The topography is mountainous, and valleys are relatively steep walled and have glaciated "U-shaped" bottoms. Spruce and subalpine fir forests dominate many of the valley bottoms, due probably to cold air accumulation. Sideslopes have mature and old forests of redcedar, western hemlock, and Douglas-fir. Lodgepole pine forests occur on the extensive coarse-textured glaciofluvial deposits in the Matthew River valley and near Sandy Lake in Bowron Provincial Park.



Douglas-fir
Pseudotsuga menziesii



Western hemlock
Tsuga heterophllya



Western redcedar
Thuja plicata

IDF
INTERIOR DOUGLAS-FIR ZONE

Overview

Location and Distinguishing Features The Interior Douglas-fir (IDF) Zone includes all portions of the Cariboo Forest Region where:

1) Douglas-fir is the climax tree species on zonal sites;
2) hybrid white spruce, subalpine fir, and western redcedar are generally absent from zonal sites except near the border with wetter climate zones, where they occur as minor species in the understory or occasionally as a few widely scattered trees;
3) bunchberry and thimbleberry are absent from zonal sites.

The principal seral tree species in this zone are lodgepole pine and trembling aspen. Pinegrass is consistently present and often dominates the undergrowth on zonal sites.

In the Cariboo Forest Region, the greatest proportion of this zone occurs on the gently rolling plateau on either side of the Fraser River in the southern half of the Region. The zone also extends westward, at elevations below about 1150 m, along the Chilcotin River, and fingers into the low-elevation valley bottoms in the Coast Mountains. The IDF Zone has a large area (approximately 16 860 km^2) of the Cariboo Forest Region and is also extensive in the Kamloops (Lloyd *et al.* 1990) and Nelson (Braumandl and Curran 1992) forest regions. It reaches its northern limit in the Cariboo Forest Region.

Climate The IDF Zone is characterized by warm, dry summers and cool, dry winters (Hope *et al.* 1991). Mean annual precipitation within the Cariboo Forest Region portion of the Zone ranges from 355 to 494 mm with an average of about 405 mm. About 50% of the annual precipitation falls during the May through September period. Peak precipitation periods are early summer (June) and early winter (January). Maximum snowpack is typically 30–50 cm in warm, dry subzones to 60–80 cm in cooler, wetter subzones. Due to the normally small amount of mid- to late summer precipitation, substantial moisture deficits are common during the growing season. Mean annual temperatures range from about 2.8 to 7.2 °C (Table 8). Frost can occur at any time during the growing season, especially in low-lying areas (Steen *et al.* 1990). Due to the light snowpack and low winter temperatures, soils are typically deeply frozen during winter months.

TABLE 8 Environmental characteristics of IDF subzones and variants in the Cariboo Forest Region

	IDFxw	IDFxm	IDFdk1	IDFdk3	IDFdk4	IDFdw	IDFmw
Area (km^2)	362	2373	20	8953	3994	1009	147
Elevation (m)	600–1000	800–1200	800–1350	750–1200	1050–1350	1050–1400	760–900
Climate							
Precipitation (mm)	no data						
Mean annual		392	386	433	355	412	494
Mean summer		203	191	207	171	134	195
Mean winter		190	195	226	213	278	300
Mean annual snowfall (cm)		145	116	231	138	142	153
Temperature (°C)							
Mean annual	3.5	4.0	5.4	3.3	2.8	3.9	7.2
Mean warmest month	15.4	16.0	17.3	14.7	13.6	14.0	18.8
Mean coldest month	-10.2	-11.0	-10.2	-10.3	-10.3	-8.5	-5.4
Frost-free days		163	180	151	122	148	211
Soils							
Zonal soils[a]	O.G.L.	O.G.L.	O.G.L.	O.G.L.	O.G.L.	Br.G.L.	Br.G.L.
Zonal humus form[b]	HR	HR	HR	HR	HR	HR	HR

[a] O.G.L. = Orthic Gray Luvisol; Br.G.L. = Brunisolic Gray Luvisol

[b] HR = HemiMor

Vegetation Climax vegetation on zonal sites in the IDF Zone is a Douglas-fir forest, often with a few lodgepole pine in the forest canopy. The Douglas-fir trees are typically multi-sized and multi-aged, and Douglas-fir regeneration is usually abundant in the understory except in the driest parts of the zone. Most stands are characterized by widely spaced, large, old Douglas-fir "vets" that have survived past ground fires. The distribution of tree seedlings is typically patchy, in response to canopy gaps, ground-fire patterns, and past surface disturbances that have created mineral soil seedbed. The forest undergrowth is most often dominated by grasses, especially pinegrass. A few shrubs, such as soopolallie, are usually scattered throughout the undergrowth. A moss layer dominated by red-stemmed feathermoss is well represented, except in very dry subzones (IDFxw, IDFxm).

Seral forests that develop after a canopy fire on zonal sites in the IDF Zone are usually dominated by lodgepole pine and, locally, by trembling aspen or ponderosa pine. Lodgepole pine forests are extensive in the cool and moist parts of the zone (IDFdk and IDFmw subzones). However, lodgepole pine is seldom present on zonal sites in the warmest and driest subzones (IDFxw and IDFxm) where Douglas-fir forests return directly after a fire, following a grass-dominated stage, or (in the IDFxw) after a ponderosa pine–dominated stage.

Grasslands and non-forested wetlands are common in the IDF Zone. Small grasslands occur locally on dry, south-facing slopes. Larger grasslands occur on the plateau, especially near the Fraser River valley, where fire history or soil factors (salinity) have prevented the establishment of forests. Wetlands are very common in the IDF outside of the Fraser River valley, and are predominantly fens, marshes, and shrub-carrs (Steen and Roberts 1988). Bogs have not been observed.

Soils Soils of the IDF Zone are developed primarily on base-rich morainal deposits (glacial till) derived from weathering of local basalt and andesite bedrock. Limestone and other bedrock types outcrop locally. Bedrock is overlain nearly everywhere by medium-textured, base-rich morainal deposits. Soil textures are mostly loamy (loam, sandy loam, silt loam, and clay loam) and often gravelly. On zonal sites, the predominant soil subgroup is Orthic Gray Luvisol having a clay-enriched horizon within 20–35 cm of the mineral soil surface. Brunisolic soils (primarily Orthic Eutric Brunisols) occur on some sandy parent materials.

Gleysols occur locally in the IDF but organic soils are very uncommon. Seepage volumes are small and, as a result, seepage sites are restricted mostly to narrow bands at the base of long slopes and riparian areas along stream channels.

Subzones and Variants of the IDF Zone in the Cariboo Forest Region

British Columbia has eight subzones of the IDF Zone. These include the seven described by Hope *et al*. (1991) and the IDFdw recognized more recently in the Cariboo Forest Region. Five of these subzones (one with three variants) are present in the Cariboo Forest Region. From driest to wettest they are:

IDFxw - Very Dry Warm IDF Subzone
IDFxm - Very Dry Mild IDF Subzone
IDFdk - Dry Cool IDF Subzone (three variants)
  IDFdk1 - Thompson Variant
  IDFdk3 - Fraser Variant
  IDFdk4 - Chilcotin Variant
IDFdw - Dry Warm IDF Subzone
IDFmw - Moist Warm IDF Subzone
  IDFmw2 - Thompson Variant

IDFxw Subzone The IDFxw includes the driest and warmest portion of the IDF Zone in the Cariboo Forest Region. It occurs primarily in the Kamloops Forest Region and includes only a small area (362 km^2)in the southeastern portion of the Cariboo Forest Region. It borders the Ponderosa Pine Zone and has many similarities to this zone. Mature forests on zonal sites are dominated by Douglas-fir, often in association with ponderosa pine. Ponderosa pine is the principal seral species, dominating some seral stands and occurring as a long-lived seral species in mature Douglas-fir stands. In contrast to most other subzones of the IDF in the Region (except the IDFxm), lodgepole pine is usually absent. Tree species regeneration is almost exclusively Douglas-fir and is typically sparse compared to other subzones of the IDF. The undergrowth vegetation is dominated by grasses, with the dominant species being pinegrass and bluebunch wheatgrass (Table 9). Very few shrubs are present, giving the stand an open, park-like appearance. This is probably the result of past wildfires and a slower rate of tree regeneration and establishment than in moister subzones.

TABLE 9 IDF vegetation table - zonal sites[a]

	Biogeoclimatic Unit	IDF xw	IDF xm	IDF dk3	IDF dk4	IDF dw	
Tree Layer	*Pinus ponderosa*	▮▮▮					Ponderosa pine
	Pseudotsuga menziesii	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	Douglas-fir
	Populus tremuloides				▮		trembling aspen
	Pinus contorta			▮▮▮▮	▮▮▮		lodgepole pine
Shrub Layer	*Juniperus communis*	▮					common juniper
	Symphoricarpos albus		▮▮▮				common snowberry
	Rosa acicularis	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	prickly rose
	Shepherdia canadensis	▮▮▮		▮▮▮	▮▮▮	▮▮▮	soopolallie
	Spiraea betulifolia		▮	▮	▮	▮▮▮	birch-leaved spirea
Herb Layer	*Balsamorhiza saggittata*	▮▮▮					arrow-leaved balsamroot
	Sedum lanceolatum	▮▮					lance-leaved stonecrop
	Elymus spicatus	▮▮▮▮▮	▮				bluebunch wheatgrass
	Allium cernuum	▮▮	▮				nodding onion
	Antennaria spp.	▮▮	▮▮			▮	pussytoes
	Achillea millefolium	▮▮	▮▮		▮▮	▮	yarrow
	Lithospermum ruderale	▮	▮				lemonweed
	Astragalus miser	▮▮	▮▮		▮▮▮	▮	timber milk-vetch
	Arctostaphylos uva-ursi	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	kinnikinnick
	Aster conspicuus	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	showy aster
	Calamagrostis rubescens	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	pinegrass
	Fragaria virginiana	▮▮	▮▮	▮▮	▮▮	▮▮	wild strawberry
	Galium boreale	▮	▮▮	▮	▮	▮	northern bedstraw
	Carex concinnoides	▮▮		▮▮▮	▮		northwestern sedge
	Goodyera oblongifolia			▮▮			rattlesnake-plantain
	Vaccinium caespitosum			▮▮▮			dwarf blueberry
	Orthilia secunda			▮▮▮			one-sided wintergreen
	Pyrola chlorantha			▮▮			green wintergreen
	Epilobium angustifolium			▮▮▮	▮		fireweed
	Linnaea borealis			▮▮▮▮	▮▮▮		twinflower
	Arnica cordifolia			▮▮▮	▮	▮▮▮	heart-leaved arnica
	Disporum trachycarpum					▮	rough-fruited fairybells
Moss Layer	*Dicranum polysetum*	▮	▮▮▮	▮▮▮	▮▮▮		wavy-leaved moss
	Cladonia spp.	▮▮▮	▮▮▮	▮▮	▮▮▮	▮▮	cladonia lichens
	Peltigera spp.	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	pelt lichens
	Pleurozium schreberi		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮	red-stemmed feathermoss
	Hylocomium splendens		▮	▮▮▮	▮		step moss
	Peltigera aphthosa			▮▮▮	▮▮▮		freckle pelt
	Cladina spp.		▮▮	▮	▮▮▮		reindeer lichens

[a] Data are for zonal sites only; IDFdk1 and IDFmw not included due to no data from Cariboo Forest Region.

Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

IDFxm Subzone The IDFxm is the driest subzone of the IDF north of Chasm. It is a moderate-sized subzone (2373 km^2) that occurs entirely within the Cariboo Forest Region, largely within the valleys of the Fraser and Chilcotin rivers. The IDFxm occurs just above the BG Zone and represents a transition between this grassland zone and the more continuous forests at higher elevations (IDFdk). Much of the IDFxm is a parkland of grasslands, aspen groves, and Douglas-fir forests. In some areas, grasslands cover more than 50% of the landscape. These grasslands are distinguished from those of the BG Zone by the presence of Rocky Mountain fescue, porcupine grass, and spreading needlegrass on zonal sites. Several grassland species occur in the IDFxm forest.

Mature forests on zonal sites in the IDFxm are dominated by relatively short (15–23 m tall) Douglas-fir. In contrast to other subzones of the IDF, no other tree species, other than occasional trembling aspen, are common on zonal sites. (Lodgepole pine occurs on some mesic sites near the IDFdk boundary and where cold air accumulates.) Tree regeneration on zonal sites is entirely Douglas-fir and is often sparse. The undergrowth is dominated by a sparse to moderate cover of grasses, with the principal species being pinegrass. Bluebunch wheatgrass and spreading needlegrass are often present. In contrast to the IDFdk and IDFmw, twinflower is not present on zonal sites and moss cover is relatively sparse and patchy.

IDFdk Subzone The IDFdk is by far the largest subzone (about 12 967 km^2) of the IDF in the Cariboo Forest Region. It occurs on the level to gently rolling plateau landscapes above the valleys of the Fraser, Chilcotin, and Chilanko rivers. The IDFdk extends about as far north as Williams Lake and as far west as Tatla Lake. It has the coldest climate of the five IDF subzones in the Cariboo Forest Region.

Climax forests on zonal sites of the IDFdk typically have a multi-aged Douglas-fir–dominated canopy, abundant Douglas-fir regeneration with a very patchy distribution, and a pinegrass-dominated undergrowth. Douglas-fir trees usually include scattered large “vets” that have survived previous wildfires. Lodgepole pine, the principal seral species in the IDFdk, is usually present in the forest canopy, while trembling aspen and white birch are occasionally present. The undergrowth typically includes a few scattered shrubs, especially soopolallie, prickly rose, and birch-leaved spirea. In contrast to the IDFxw and IDFxm, twinflower is common.

Three biogeoclimatic variants of the IDFdk subzone occur in the Cariboo Forest Region.

The IDFdk1 Variant is centred in the Kamloops Forest Region (Lloyd *et al.* 1990) and includes only a very small area (20 km^2) within the Cariboo Forest Region. It is very similar to the IDFdk3 except that it tends to have fewer herbaceous species and less kinnikinnick, and the Douglas-fir regeneration is less patchy.

The IDFdk3 Variant is the most extensive variant (8953 km^2) of the IDFdk Subzone in the Cariboo Forest Region. It includes a broad area of the level to gently rolling Fraser Plateau east of the Fraser River valley, from the southeastern limits of the Region northwestward to about Williams Lake. At its lower elevations, the IDFdk3 borders the IDFxm, while at higher elevations it is replaced by the cold, dry climates of the SBPS and MS zones. At its eastern limits, where precipitation increases, the IDFdk3 borders the spruce climax forests of the SBSdw and SBPSmk. The climate of the IDFdk3 is similar to that of the IDFdk1 but is more moist and warmer than that of the IDFdk4. Compared to the IDFdk4, the IDFdk3 has a greater cover of mosses and twinflower and a smaller cover of lichens and kinnikinnick.

The IDFdk4 Variant lies on the gently rolling plateau bordering the valleys of the Chilcotin and Chilanko rivers. It extends from the upper slopes of these river valleys (about 950 m) across the gently rising plateau to about 1150 or 1200 m where it borders the SBPSxc. The IDFdk4 is the coldest biogeoclimatic unit of the IDF Zone in British Columbia and is climatically transitional from the IDF to the cold, dry SBPS Zone. Cold air accumulation areas in the IDFdk4 include lodgepole pine forests that are similar to those on zonal sites in the SBPSxc.

IDFdw Subzone The IDFdw is a relatively small subzone (1009 km^2) that occurs only in the Cariboo Forest Region, in the valleys of the Coast Mountains. It occurs primarily in the valleys of Chilko and Tatlayoko lakes and Mosley (West Branch) Creek. Due to the influence of coastal air masses, the IDFdw has a warm, moist climate relative to most other parts of the IDF Zone in the Region. The IDFdw occurs from valley bottoms to approximately 1050 m, where it borders the MSdc subzone. The IDFdw is replaced by the Coastal Western Hemlock Zone in the bottoms of the Mosley Creek and Homathko River valleys as they approach the coast.

Mature forests on zonal sites of the IDFdw are dominated by multi-sized Douglas-fir but the forest canopy often includes lodgepole pine and occasional subalpine fir. This is the only subzone of the IDF in the Cariboo Forest Region with subalpine fir on zonal sites. Douglas-fir is the predominant species of tree regeneration. The undergrowth is dominated on zonal sites by a moderate cover of shrubs and herbaceous species. Common shrubs are birch-leaved spirea, prickly rose, and soopolallie. Pinegrass is the dominant herbaceous species but it is much less abundant than on zonal sites in the IDFdk. The cover of mosses and lichens is sparse.

IDFmw2 Variant The IDFmw2 is a small variant that occurs primarily in the Kamloops Forest Region (Lloyd *et al.* 1990) and includes a small area (147 km^2) of the Cariboo Forest Region around Canim Lake. The IDFmw2 lies below the ICHdk and ICHmk subzones. It has a moist climate relative to other IDF subzones and variants in the Cariboo Forest Region and, as a result, has similarities to ICH subzones.

The canopy of mature forests on zonal sites in the IDFmw2 is dominated by Douglas-fir but usually includes scattered western redcedar. The understory includes Douglas-fir and some western redcedar. The undergrowth is dominated by a moderate cover of shrubs, including falsebox, birch-leaved spirea, and Douglas maple. A sparse to moderate cover of herbaceous plants includes pinegrass, twinflower, and prince's pine. Lodgepole pine, paper birch, and trembling aspen dominate seral forests.

MS
Montane Spruce Zone

Overview

Location and Distinguishing Features The Montane Spruce Zone occurs at middle to high elevations, below the ESSF Zone, in dry climates of the western Cariboo Forest Region. It is distinguished from other zones in the Region by the following set of characteristics:

1) forests are dominated primarily by lodgepole pine and occasionally by hybrid white spruce and/or subalpine fir;
2) hybrid white spruce and/or subalpine fir are common in lodgepole pine stands;
3) western redcedar, western hemlock, and ponderosa pine are absent; Douglas-fir is rarely present on zonal sites;
4) black crowberry or grouseberry are often present in the undergrowth on zonal sites (uncommon in MSdc2 and MSdv);
5) ESSF Zone indicator species (Sitka valerian, white-flowered rhododendron, and mountain sagewort) are absent from zonal sites; these species may be found on cool north aspects and on cold air accumulation sites.

The MS Zone represents a transition between the SBPS or IDF zones at lower elevations and dry ESSF subzones at higher elevations. In the Cariboo Forest Region, it occurs below the ESSFxv and ESSFxc and has considerable similarities to these zones as well as to the SBPS Zone. It does not occur below the wetter ESSF subzones such as the ESSFwk. The boundary between the MS and SBPS zones can be determined based on the occurrence of subalpine fir, grouseberry, black crowberry, western meadowrue, or arctic lupine in the MS. The border between the MS and ESSF zones is less distinct.

In the Cariboo Forest Region, the MS Zone occurs on the broad, rising plateau surrounding the Itcha and Ilgachuz mountains; the leeward side of the Coast Mountains from Tweedsmuir Park to the Camelsfoot Range; and on the Camelsfoot and Marble ranges. Elevation ranges are generally 1250–1500 m in the Itcha–Ilgachuz area and 1450–1700 m in the Coast Mountains and Marble Range. The MS Zone is also well represented in the Kamloops (Lloyd *et al.* 1990) and Nelson (Braumandl and Curran 1992) forest regions.

Climate The Montane Spruce Zone has a cool, continental climate characterized by cold winters and moderately short, warm summers (Hope *et al.* 1991). Although there are no long-term climatic data from this zone in the Cariboo Forest Region, the location of the MS Zone above the SBPS and, to a lesser extent, above the IDF, implies that temperatures are colder, growing seasons are shorter, and precipitation is greater than in these other zones. Short-term data from the Itcha–Ilgachuz area indicate that night-time subfreezing temperatures are common during the growing season (Steen *et al.* 1990). Mean annual precipitation is small but probably slightly greater than the 440 mm recorded in the SBPS. Mid winter snowpack depths are commonly 60–100 cm.

The cool summers and cold winters of the MS Zone result largely from its position in the strong rainshadow of the Coast Mountains and its high elevations. The low precipitation, dry air, and clear skies in the rainshadow result in significant night-time radiation cooling and low overnight temperatures.

TABLE 10 Environmental characteristics of MS subzones and variants in the Cariboo Forest Region

	MSxv	MSxk	MSdc2	MSdv
Area (km)	8731	605	798 (MSdc2 and MSdv combined)	
Elevation range (m)	1450–1700 (S) 1250–1500 (N)	1450–1700	1200–1525	1150–1700
Climate	no data	no data	no data	no data
Soils				
Zonal soils[a]	E.DYB. (BR.GL)	E.DYB. (BR.GL)	BR.GL	BR.GL
Zonal humus form[b]	HR	HR	HR	HR

[a] E.DYB. = Eluviated Dystric Brunisol; BR.GL = Brunisolic Gray Luvisol
[b] HR = HemiMor

Vegetation Lodgepole pine forests dominate the MS landscape. Most stands have an even-aged, even-sized canopy, which originated following wildfire. Hybrid white spruce is the principal tree species in the understory, followed by subalpine fir and lodgepole pine. In many stands, especially those less than 80–100 years old, tree regeneration is sparse. Due to the slow growth of spruce and subalpine fir under a pine canopy in these cold, dry climates, the lodgepole pine forests are long-persisting seral stages. For example, many lodgepole pine stands more than 200 years old have only scattered spruce and subalpine fir in the canopy. The undergrowth vegetation on zonal sites is a low-growing carpet of mosses and lichens, low herbaceous plants, and dwarf shrubs with very few tall shrubs or tall herbaceous plants. In the MSxv, which occurs along the Coast Mountains and in the Itcha–Ilgachuz area, the undergrowth is dominated by mosses, lichens, crowberry, grouseberry, twinflower, and other low forbs. In the MSxk in the Marble Range and Hihium Lake area, the undergrowth is dominated by pinegrass, twinflower, and feathermosses, with scattered grouseberry. Lichens are common but less abundant than in the SBPS Zone. Other stand types in the MS Zone include spruce stands on moist lower slopes and at the edge of wetlands and streams, and Douglas-fir forests on some south-facing slopes where the MS Zone occurs above the IDF Zone. Deciduous forests are uncommon.

Wetlands are moderately common in portions of the MS Zone with gently sloping terrain and poorly defined drainage channels. Shrub-carrs and fens are predominant types. Grasslands are uncommon in the MS but moist meadows and shrub-carrs occur frequently in topographic basins where cold air accumulates.

Soils Soils of the MS Zone are developed primarily on loam and sandy loam morainal parent materials derived from weathering of basalt and a variety of other bedrock types. Local areas of sandy soils on glaciofluvial materials or on morainal deposits derived from granitic and metasedimentary rocks are also present. Soil development is weak, and predominant soil types are Eluviated Dystric Brunisols and Brunisolic Gray Luvisols. Podzols occur on some sandy parent materials. The forest floor is typically thin (<5 cm) and humus forms are predominantly hemimors.

Seepage volumes are generally higher in the MS than in the SBPS. Moist soils, resulting from seepage, often limit soil warming on lower slopes and in basins and therefore limit vegetation production.

Subzones of the MS Zone in the Cariboo Forest Region

Four subzones, one represented by a single variant, occur in the Cariboo Forest Region.
MSxk - Very Dry Cool MS Subzone
MSxv - Very Dry Very Cold MS Subzone
MSdv - Dry Very Cold MS Subzone
MSdc - Dry Cold MS Subzone
  MSdc2 - Tatlayoko Variant

MSxk Subzone The MSxk is interpreted to be the warmest MS subzone in the Cariboo Forest Region. In British Columbia it occurs in the central part of the Thompson Plateau and on the southern edge of the Fraser Plateau, north from the U.S. border to the Clinton area. In the Cariboo Forest Region it occurs in the Hihium Lake, Bonaparte Lake, and eastern Marble Range area at elevations above the IDFdk3 and below the ESSFxv or ESSFxk. It has many similarities, in terms of climate and zonal site vegetation, to the SBPSmk subzone, but is differentiated from it by the presence of grouseberry on zonal sites. Mature forests on zonal sites are dominated by even-aged, even-sized lodgepole pine and usually contain a few spruce in the forest canopy and regeneration layers. In contrast to other MS subzones, subalpine fir is uncommon and pinegrass is abundant on zonal sites. Deciduous trees are less common than in the SBPS or IDF. The undergrowth vegetation of mature forests on zonal sites is dominated by pinegrass, feathermosses, and twinflower (Table 11). Grouseberry is usually present, although often not abundant. Tree species regeneration is often sparse and is primarily hybrid white spruce. Few shrubs are present.

MSxv Subzone The MSxv is the most extensive subzone of the MS Zone in the Cariboo Forest Region. The largest area of MSxv occurs on the gently rising topography surrounding the Itcha and Ilgachuz Mountains. The subzone also occurs all along the leeward slopes of the Coast Mountains where mid to high-elevation slopes face onto the Interior Plateau. In the inner valleys of the Coast Mountains, it is replaced by the MSdc and MSdv subzones. The MSxv typically occurs above the SBPSxc or SBPSdc and below the ESSFxv.

TABLE 11 MS vegetation table - zonal sites[a]

	Biogeoclimatic Unit	MSxv	MSxk	MSdc2	MSdv	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	lodgepole pine
	Picea engelmannii x glauca	▮		▮		hybrid white spruce
	Abies lasiocarpa			▮▮▮▮		subalpine fir
Shrub Layer	*Vaccinium membranaceum*		▮▮			black huckleberry
	Rhododendron albiflorum		▮			white-flowered rhododendron
	Juniperus communis	▮▮▮	▮▮▮		▮	common juniper
	Shepherdia canadensis	▮	▮▮▮	▮	▮▮▮▮	soopolallie
	Rosa acicularis	▮	▮▮▮		▮▮▮	prickly rose
	Picea engelmannii x glauca	▮▮▮	▮▮		▮▮▮	hybrid white spruce
	Abies lasiocarpa			▮▮▮▮	▮▮▮	subalpine fir
	Lonicera involucrata				▮▮	black twinberry
Herb Layer	*Empetrum nigrum*	▮▮▮▮				crowberry
	Vaccinium scoparium	▮▮▮▮	▮▮▮		▮	grouseberry
	Cornus canadensis	▮▮▮	▮	▮	▮▮▮	bunchberry
	Vaccinium caespitosum		▮▮▮		▮▮	dwarf blueberry
	Arctostaphylos uva-ursi		▮			kinnikinnick
	Orthilia secunda	▮	▮▮	▮▮	▮	one-sided wintergreen
	Calamagrostis rubescens	▮	▮▮▮▮▮		▮▮▮▮	pinegrass
	Linnaea borealis	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	twinflower
	Arnica cordifolia	▮▮▮	▮▮▮	▮▮▮	▮▮▮	heart-leaved arnica
	Epilobium angustifolium	▮▮			▮▮	fireweed
	Aster conspicuus		▮▮▮		▮▮▮▮	showy aster
	Fragaria virginiana				▮▮	wild strawberry
	Osmorhiza chilensis				▮▮	mountain sweet-cicely
	Galium boreale				▮▮	northern bedstraw
	Thalictrum occidentale				▮▮▮	western meadowrue
	Lupinus arcticus				▮▮▮	arctic lupine
Moss Layer	*Cladina* spp.	▮▮▮				reindeer lichens
	Cladonia spp.	▮▮▮	▮▮	▮▮▮	▮	cladonia lichens
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮	▮▮▮▮	red-stemmed feathermoss
	Dicranum spp.	▮▮▮	▮	▮▮▮	▮▮▮	heron's-bill mosses
	Peltigera aphthosa	▮▮▮	▮▮▮		▮▮▮	freckle pelt

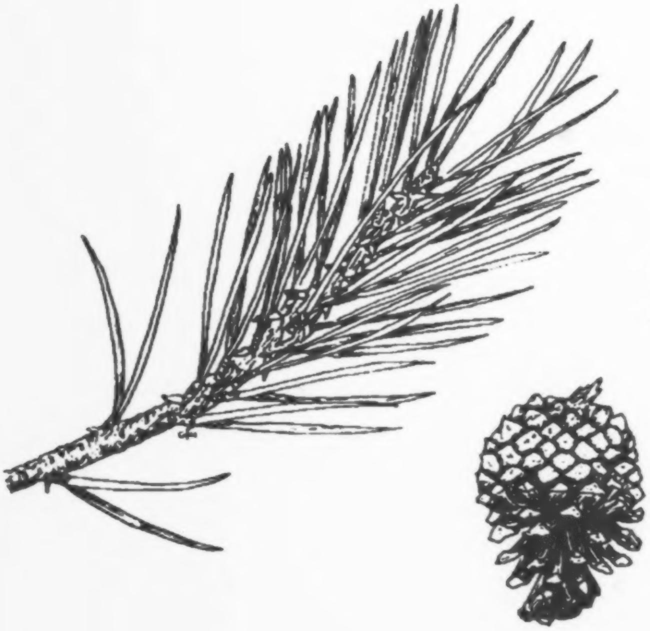
Data are for zonal sites only.

Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

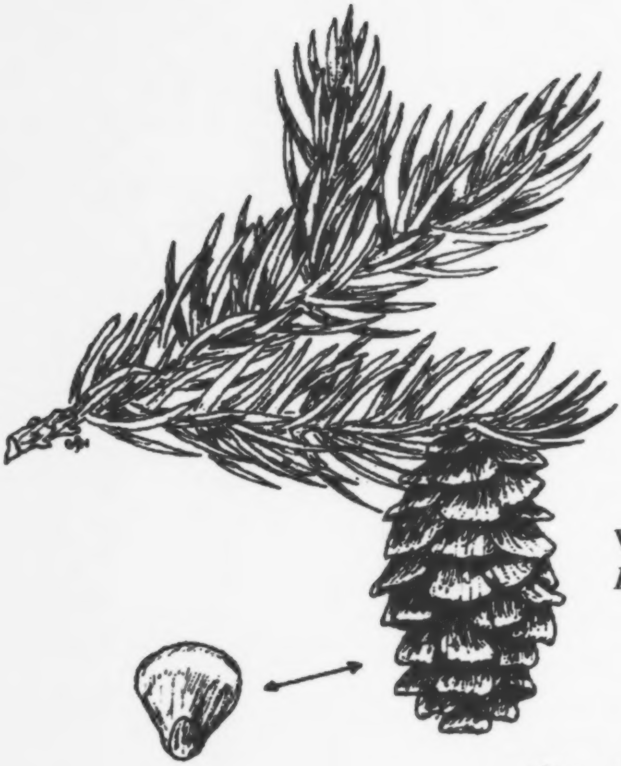
The MSxv is the coldest and driest subzone of the MS in British Columbia and also one of the least productive biogeoclimatic units for tree growth. Winters are cold and summers are cool with frequent growing-season frost. Mature forests on zonal sites are predominantly even-aged, even-sized lodgepole pine forests with scattered hybrid white spruce. Subalpine fir is common in the southern but not the northern parts of the subzone. Vegetation succession in this climate is very slow, and pine stands more than 200 years old often have few spruce or subalpine fir trees in the canopy. In contrast to other subzones of the MS, Douglas-fir is absent from all ecosystems of the MSxv, and crowberry is common on zonal sites. The undergrowth vegetation on zonal sites is dominated by crowberry, grouseberry, a small number of low forb species (such as bunchberry), mosses, and lichens. Feathermosses, especially red-stemmed feathermoss, dominate the moss layer. Very few medium or tall shrubs are present. In contrast to the SBPSxc, mature pine stands have a relatively closed canopy and little pine regeneration in the understory. Mountain pine beetle, which has caused extensive mortality of lodgepole pine trees in the SBPS, has much less impact in the MSxv.

MSdc2 Variant The MSdc is a relatively small subzone that occurs in the valleys of the Coast Mountains in the Kamloops and Cariboo forest regions. In the Cariboo Forest Region it is represented by the MSdc2 variant, which occurs in the valleys of Chilko and Tatlayoko lakes, Mosley Creek, and Klinaklini and Atnarko rivers above the IDFdw and below the ESSFxv. The climate in this area is moderated somewhat by coastal influences and, as a result, winters are less cold and summers have less frequent frost than in the MSxv. Mature forests on zonal sites are predominantly lodgepole pine stands, often with moderate amounts of subalpine fir and trembling aspen, scattered spruce, and occasionally Douglas-fir. The undergrowth of these stands contains more species and is more productive than that of the MSxv. The undergrowth is dominated by low- to medium-height forbs and grasses with comparatively few mosses or lichens. The shrub layer is typically sparse and consists mostly of soopolallie and Sitka alder. Common herbaceous plants are heart-leaved arnica, twinflower, and bunchberry. In contrast to the MSxv, grouseberry and crowberry are seldom present.

MSdv Subzone The MSdv is a very small subzone that occurs only in the Cariboo Forest Region. It occurs east of Chilko Lake in valley bottoms and on lower valley slopes of the Yohetta Valley and Taseko Lakes area. Forests are dominated by lodgepole pine but frequently include hybrid white spruce in the canopy and both spruce and subalpine fir in the understory. Douglas-fir is absent. Shrubs are moderately abundant on zonal sites and are predominantly soopolallie, prickly rose, and black twinberry. The undergrowth is distinguished from that of the MSdc2 by the presence of common arctic lupine, greater vascular plant cover (particularly pinegrass and showy aster), and a greater number of grass and forb species.

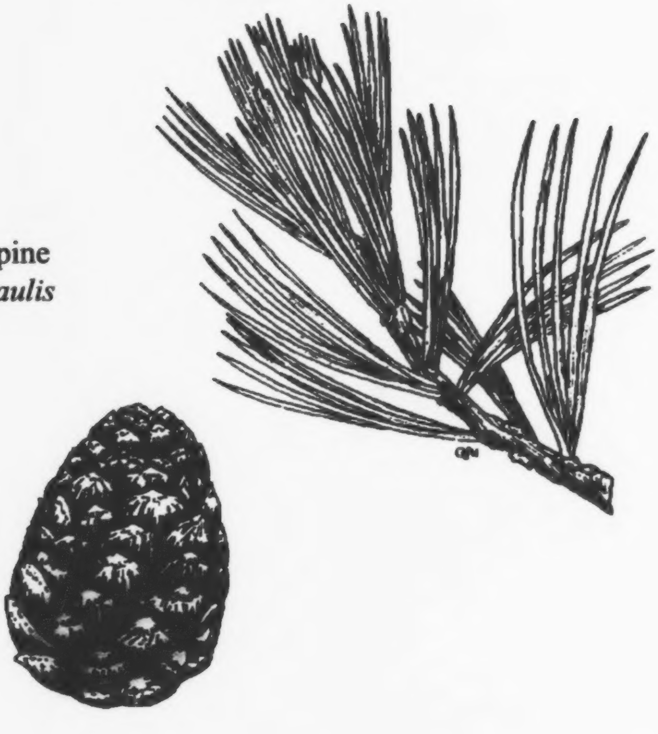


Lodgepole pine
Pinus contorta



White spruce
Picea glauca

Whitebark pine
Pinus albicaulis



MH
Mountain Hemlock Zone

Overview

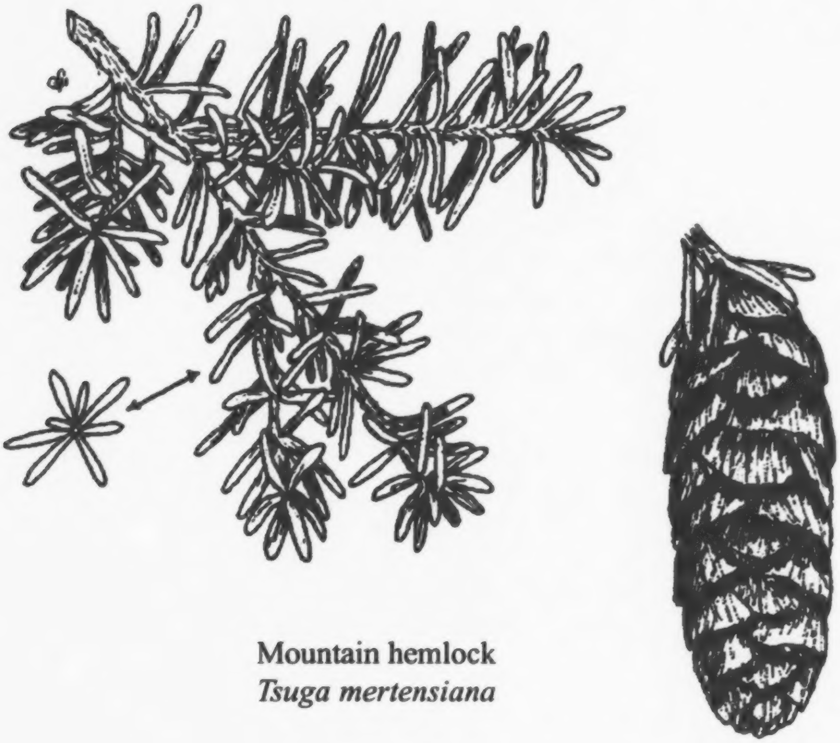
The Mountain Hemlock Zone is the highest-elevation forested zone in maritime and submaritime climates of British Columbia (Pojar *et al.* 1991b). It occurs immediately below the Alpine Tundra Zone in the coastal mountains within the Vancouver and Prince Rupert forest regions. A very small portion of the MH Zone (approximately 110 km^2) extends into the Cariboo Forest Region on high peaks bordering lower Mosley Creek and the Homathko River valley downstream of Mosley Creek.

The Mountain Hemlock Zone is distinguished from other zones in British Columbia by the presence of mountain hemlock in the forest canopy or understory layers. Other common tree species include amabilis fir and yellow-cedar. Where the MH Zone is transitional to the ESSF Zone, as in the Cariboo Forest Region, subalpine fir is common.

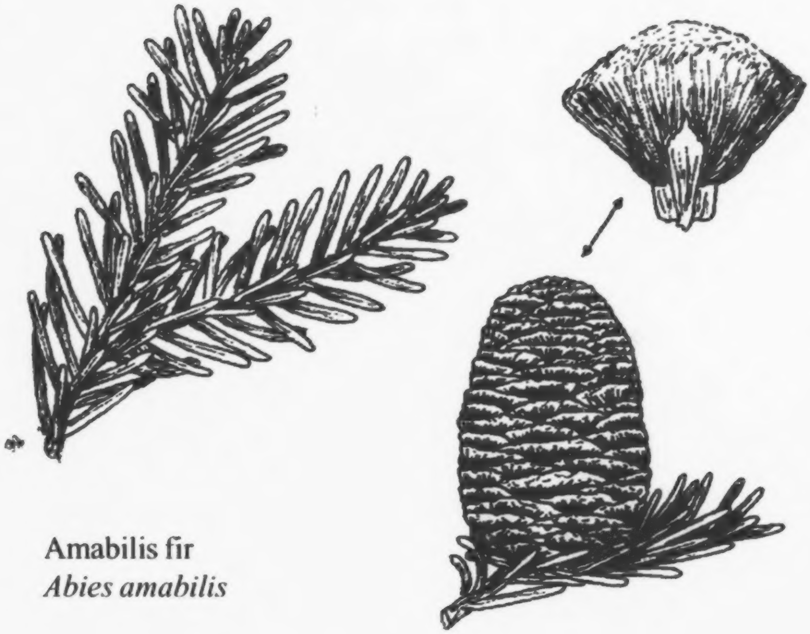
Continuous forests in the MH Zone are confined primarily to the low elevations of the zone. At higher elevations, trees occur in isolated clumps, irregular patches, and on ridge crests where the snow melts earlier. Intervening areas are commonly subalpine heath, meadow, or fen.

Vegetation of the MH Zone is characterized by the predominance of ericaceous shrubs. Common species are Alaskan blueberry, oval-leaved blueberry, false azalea, and black huckleberry. At high elevations and on non-forested sites, pink and white mountain heathers and Sitka valerian are common.

The MH Zone in the Cariboo Forest Region is included in the MHmm2 (Leeward Moist Maritime MH Variant). Refer to the guides to ecosystems of the Prince Rupert (Banner *et al.* 1993) and Vancouver (Green and Klinka 1994) forest regions for a description of this variant.



Mountain hemlock
Tsuga mertensiana



Amabilis fir
Abies amabilis

SBPS
Sub-Boreal Pine–Spruce Zone

Overview

Location and Distinguishing Features The Sub-Boreal Pine–Spruce Zone is distinguished from other zones in British Columbia by having the following set of characteristics:

1) lodgepole pine is the climax or long-persistent seral tree species on zonal sites;
2) lodgepole pine is the most common species of tree regeneration beneath the forest canopy;
3) the only other coniferous tree species common on zonal sites is hybrid white spruce (or white spruce);
4) the undergrowth vegetation on zonal sites is dominated primarily by pinegrass, kinnikinnick, lichens, and (except in the SBPSxc) mosses.

The Sub-Boreal Pine–Spruce Zone is the most extensive zone (21 948 km^2) on the level to gently rolling landscapes of the Fraser Plateau west of the Fraser River. It also occurs on the southernmost portions of the Nechako Plateau, north of the Blackwater River (Steen and Demarchi 1991) and along the eastern edge of the Fraser Plateau from the McIntosh Lakes to Bonaparte Lake areas. Elevations in the northern and eastern parts of the zone are mostly 900–1250 m, while in southern and western areas, elevations range from approximately 1100 to 1500 m. The SBPS occurs above the IDF Zone and below the MS Zone in the Chilcotin River drainage. In the Nazko River area, the SBPS occurs above the SBSdw and below the SBSmc. East of the Fraser River, it occurs primarily on an area of low-relief terrain east of the IDFdk and west of the SBSdw subzones.

The SBPS Zone occurs primarily in the Cariboo Forest Region. Smaller portions occur in the Prince Rupert, Prince George, and Kamloops forest regions, although the extent of the zone in the latter two forest regions is very small.

Climate The SBPS Zone has cold, dry winters and cool, dry summers. Mean annual precipitation ranges from 335 to 580 mm with an average of about 440 mm (Table 12). Peak precipitation periods are early summer (June) and early winter (January). About half of the annual precipitation falls during the May through September period, while 30–50% falls as snow during the remainder of the year. Peak snowpack in most years is generally 40–60 cm. Substantial moisture deficits are normal during the middle and latter parts of the growing season. Mean annual temperatures range from 0.3 to 3.2 °C with an average of 1.9 °C. Subfreezing temperatures can occur at any time of the year, especially in low-lying areas (Steen *et al*. 1990).

The cool summers and cold winters of the SBPS Zone result largely from its position in the strong rainshadow of the Coast Mountains and its moderately high elevations. The low precipitation, dry air, and clear skies in the rainshadow result in significant night-time radiation cooling and low overnight temperatures. Based on annual climatic means, the SBPS Zone is colder than all other zones in the Cariboo Forest Region with the exception of the MS, ESSF, and AT zones and is drier than all other zones except the BG and IDF zones. It is one of the least productive areas for tree growth in the Region outside of the BG and AT zones.

TABLE 12 Environmental characteristics of SBPS subzones in the Cariboo Forest Region

	SBPSxc	SBPSdc	SBPSmc	SBPSmk
Area (km²)	10898	4227	1165	5658
Elevation range (m)	1100–1500 (S) 850–1300 (N)	900–1280	900–1250	950–1350 (S) 900–1250 (N)
Climate				
Precipitation (mm)				
Mean annual	389	508	no data	506
Mean summer	177	275	196	232
Mean winter	212	233	no data	283
Mean annual snowfall (cm)	179	178	no data	no data
Temperature(°C)				
Mean annual	1.7	1.9	0.8	3.2
Mean - warmest month	12.3	13.9	10.9	13.7
Mean - coldest month	-11.8	-13.5	-12.5	-10.3
Frost-free days	93	152	no data	no data
Soils				
Zonal soils[a]	O.DYB (O.GL)	O.DYB (O.GL)	O.DYB	O.GL
Zonal humus form[b]	HR	HR	HR	HR

[a] O.DYB = Orthic Dystric Brunisol; O.GL = Orthic Gray Luvisol

[b] HR = HemiMor

Vegetation The SBPS landscape is dominated by extensive lodgepole pine forests and abundant wetlands. Smaller areas of spruce and trembling aspen forests are present and small grasslands and meadows occur locally. The abundance of wetlands is due to poorly developed drainage patterns. Late seral or climax vegetation on zonal sites is a lodgepole pine or lodgepole pine – spruce forest. The spruce is primarily hybrid white spruce except in the driest parts of the zone (SBPSxc) where the spruce is typically white spruce. Due to extensive fire history, most stands are young (<140 years), even-aged, and often dense. The lodgepole pine trees are generally of uniform size. White spruce seldom dominates stands on zonal sites but, where it is present, it typically has a wider range in size and age than pine. Lodgepole pine is the most common species of regeneration on most zonal sites. Its distribution is typically patchy in response to canopy gaps and past disturbances that have created a mineral soil seedbed. The undergrowth of forests on zonal sites is most often dominated by pinegrass, kinnikinnick, and a variety of lichens (especially *Cladonia* spp.). Other shrubs, especially prickly rose and common juniper, are often scattered through the stand. Lichens dominate the bryophyte/lichen layer in the very dry southwestern parts of the zone, but mosses are dominant elsewhere.

Trembling aspen stems are common and frequently dominate small stands, especially on moist sites. Small spruce stands are common at the fringe of wetlands and along stream courses. Douglas-fir forests occur locally in the SBPS, primarily on upper slopes that are freely drained of cold air. They are most common east of the Fraser River in the SBPSmk. Other tree species that occur locally are subalpine fir (moist sites in eastern parts of zone), black spruce (cold air accumulation sites in northern parts of zone), and black cottonwood (floodplains of some rivers).

Non-forested wetlands, meadows, and shrublands are very common and often extensive on the SBPS landscape due to poorly developed drainage patterns. The most common types are fens, shrub-carrs, swamps, and meadows (Roberts 1984). Bogs are uncommon but occur more frequently than in the IDF Zone. They are most common in northern parts of the zone. Tree establishment in meadows and shrub-carrs is limited by frequent summer frosts, cold soils, and occasionally soil salinity.

Soils Soils of the SBPS Zone are developed primarily on base-rich, sandy loam morainal deposits derived from weathering of basalt and a variety of other bedrock types. In western parts of the zone, especially south of Anahim Lake, morainal deposits are derived from granitic and metasedimentary rocks and are coarse textured. Sandy glaciofluvial outwash deposits are also common. Soil development in the SBPS Zone is weak, and soils on zonal sites are predominantly Orthic Dystric Brunisols and Brunisolic Gray Luvisols. The clay-enriched horizon of the Luvisols is weakly developed and typically within 15–20 cm of the soil surface. Soil textures are predominantly sandy loam and often gravelly. The surface organic layer is typically very thin (<4 cm) and has very slow rates of decomposition. Humus forms are predominantly hemimors.

Seepage volumes in the SBPS are small, and permanent seepage is infrequent in forested ecosystems. Sustained seepage occurs in broad, sloping, diffuse drainage tracks vegetated by wetland species. Forested seepage sites occur primarily as narrow bands at the base of long north-facing slopes and adjacent to drainage channels.

Subzones of the SBPS Zone in the Cariboo Forest Region

The SBPS Zone includes four subzones. From driest to wettest they are:
SBPSxc - Very Dry Cold SBPS Subzone
SBPSdc - Dry Cold SBPS Subzone
SBPSmc - Moist Cold SBPS Subzone
SBPSmk - Moist Cool SBPS Subzone

No biogeoclimatic variants have been identified. Mature forest vegetation on zonal sites in the four subzones is compared in Table 13.

SBPSxc Subzone The SBPSxc occurs in the southern and western parts of the zone, in an arc along the inside of the Coast Mountains as far north as the Rainbow Range. This area is strongly affected by the Coast Mountains rainshadow, and the SBPSxc has the least annual precipitation of the SBPS subzones (Table 12). Vegetation production and soil development are severely limited by the cold, very dry climate.

TABLE 13 SBPS vegetation table - zonal sites[a]

	Biogeoclimatic Unit	SBPSxc	SBPSdc	SBPSmc[b]	SBPSmk	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	lodgepole pine
	Picea glauca			▮▮▮▮	▮▮▮	white spruce
Shrub Layer	*Juniperus communis*	▮▮▮	▮▮▮			common juniper
	Shepherdia canadensis	▮▮▮	▮▮▮	▮▮▮	▮	soopolallie
	Rosa acicularis	▮▮▮	▮▮▮	▮▮▮	▮▮▮	prickly rose
	Spiraea betulifolia	▮	▮▮	▮	▮▮▮	birch-leaved spirea
	Amelanchier alnifolia				▮▮	saskatoon
	Vaccinium membranaceum				▮▮▮	black huckleberry
Herb Layer	*Oryzopsis pungens*	▮▮				short-awned ricegrass
	Carex richardsonii	▮▮▮	▮			Richardson's sedge
	Solidago spathulata	▮▮	▮			spike-like goldenrod
	Arctostaphylos uva-ursi	▮▮▮▮▮	▮▮▮	▮▮▮	▮	kinnikinnick
	Geocaulon lividum		▮▮		▮	bastard toad-flax
	Linnaea borealis	▮▮▮	▮▮▮	▮▮▮	▮▮▮	twinflower
	Epilobium angustifolium	▮▮	▮▮	▮▮	▮▮	fireweed
	Vaccinium caespitosum	▮	▮▮▮	▮▮▮	▮▮▮	dwarf blueberry
	Fragaria virginiana	▮▮	▮▮		▮▮	wild strawberry
	Calamagrostis rubescens	▮▮▮▮	▮▮▮▮		▮▮▮▮▮	pinegrass
	Orthilia secunda		▮		▮▮	one-sided wintergreen
	Aster conspicuus		▮		▮▮	showy aster
	Arnica cordifolia		▮▮	▮	▮▮▮	heart-leaved arnica
	Cornus canadensis		▮▮▮	▮▮▮	▮▮▮▮	bunchberry
	Goodyera oblongifolia				▮▮	rattlesnake-plantain
	Aster ciliolatus		▮		▮▮	fringed aster
	Lilium columbianum				▮▮	tiger lily
	Pyrola chlorantha				▮▮	green wintergreen
Moss Layer	*Cladonia* spp.	▮▮▮▮	▮	▮▮▮		cladonia lichens
	Cladina spp.	▮▮▮	▮▮▮	▮▮▮		reindeer lichens
	Peltigera spp.	▮▮▮		▮▮▮	▮	pelt lichens
	Peltigera aphthosa	▮	▮▮▮	▮	▮▮	freckle pelt
	Dicranum polysetum	▮	▮▮▮		▮▮▮	wavy-leaved moss
	Pleurozium schreberi	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	red-stemmed feathermoss
	Hylocomium splendens				▮	step moss
	Ptilium crista-castrensis			▮	▮▮▮▮	knight's plume

[a] Data are for zonal sites only. [b] Data are from Prince Rupert Forest Region portion of this subzone.

Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

Soil organic accumulations are small due to low vegetation production and a history of frequent wildfires. These fires have left a mosaic of stand ages, with a high proportion of young stands. Mature lodgepole pine trees are typically short (<18 m) and open-grown.

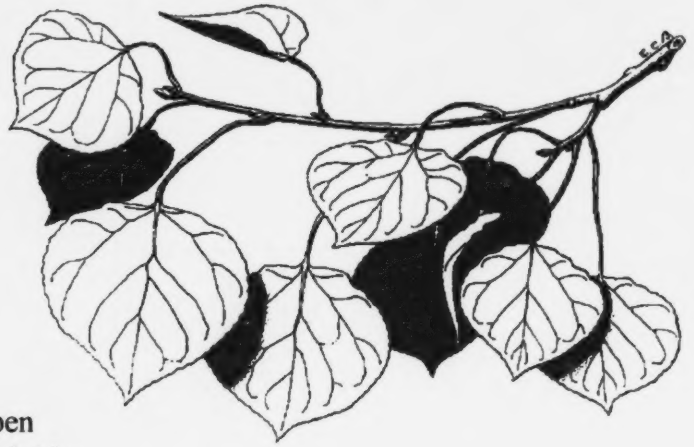
Lodgepole pine is the only common species of tree regeneration on zonal sites in the SBPSxc. White spruce occurs on moist sites, principally at the perimeter of wetlands, but is uncommon on the uplands. Trembling aspen is the only other common tree species in the SBPSxc and is scattered throughout the forest. The forest undergrowth on zonal sites is dominated by kinnikinnick, pinegrass, and lichens (Table 13). In contrast to other SBPS subzones, lichens are much more abundant than mosses. Within the Cariboo Forest Region, the proportion of white spruce compared to hybrid white spruce is apparently greatest in the SBPSxc.

SBPSdc Subzone The SBPSdc occurs on the Fraser Plateau north and east of the SBPSxc in an area less strongly affected by the Coast Mountains rainshadow. Although nearly all stands on zonal sites are dominated by lodgepole pine, hybrid white spruce is often present in the understory and occasionally present as scattered stems in the canopy. The forest canopy is typically more closed than in the SBPSxc. Lodgepole pine is the predominant species of tree regeneration. The undergrowth vegetation on zonal sites is dominated by pinegrass, kinnikinnick, mosses, and lichens (Table 13). Pinegrass is more abundant and more vigorous and the moss layer is better developed than in the SBPSxc. This subzone is transitional in climate and vegetation between the SBPSxc and the SBPSmk.

SBPSmc Subzone The SBPSmc occurs only in the northwest part of the Cariboo Forest Region, north of the Itcha and Ilgachuz mountains. It is more extensive in the Prince Rupert Forest Region. As in the SBPSdc, hybrid white spruce is common in this subzone but unlike all other SBPS subzones, pinegrass is uncommon (Table 13). The undergrowth is dominated by feathermosses, lichens, and kinnikinnick. This subzone is climatically and ecologically transitional to cold, dry portions of the SBS zone, particularly the SBSmc3.

SBPSmk Subzone The SBPSmk occurs in the eastern portions of the Fraser Plateau where the Coast Mountain rainshadow effect is weaker than in other parts of the zone. It includes the warmest and wettest portions of the SBPS Zone and is the only subzone of the SBPS in which Douglas-fir is occasionally present on zonal sites. Within the area of its distribution, the SBPSmk occurs on two types of terrain. South of the Blackwater River in the north-central part of the Cariboo Forest Region and near Bonaparte Lake, it occurs on hilly terrain at mid elevations. In the McIntosh Lakes to Sheridan Lake area, it occurs on level to gently rolling terrain where elevations are often lower but frost is common due to poor cold air drainage.

Although nearly all forests on zonal sites are dominated by lodgepole pine, hybrid white spruce is usually present in the canopy and regeneration layers. Lodgepole pine regeneration is generally less abundant in mature forests than in the SBPSxc or SBPSdc due to the more closed canopy. Small trembling aspen stands are common, and aspen is often scattered through the pine canopy. Douglas-fir is more common than in any other SBPS subzone. It occurs primarily at lower elevations and on sites freely drained of cold air. The undergrowth on zonal sites is dominated by pinegrass and feathermosses. Shrubs, including black huckleberry, are more common than in other SBPS subzones.



Trembling aspen
Populus tremuloides

SBS
Sub-Boreal Spruce Zone

Overview

Location and Distinguishing Features The Sub-Boreal Spruce (SBS) Zone is part of the Canadian Boreal Forest Region (Krajina 1965) but is broadly transitional between the true boreal forest (BWBS Zone) to the north and to both the warmer montane Douglas-fir forest (IDF Zone) to the south and the drier lodgepole pine – white spruce forest (SBPS Zone) to the southwest (Meidinger *et al.* 1991). The SBS Zone is distinguished from other zones of British Columbia by the following set of characteristics:

1) hybrid white spruce and subalpine fir are climax tree species on zonal sites;
2) lodgepole pine is a common seral species on zonal sites; spruce and subalpine fir are principal species of regeneration in pine stands;
3) Douglas-fir is occasionally a long-lived seral species on warmer sites and on zonal sites near the southeastern limits of the zone;
4) subalpine species characteristic of the MS Zone (grouseberry, black crowberry, Utah honeysuckle) or the ESSF Zone (white-flowered rhododendron, Sitka valerian, arrow-leaved groundsel, bracted lousewort, mountain sagewort) are rarely present.

The Sub-Boreal Spruce Zone dominates the landscapes of the central Interior of British Columbia (Meidinger *et al.* 1991) and is extensive on the plateau landscapes of the southern Prince George and Prince Rupert forest regions. The southern and warmest limit of its range is in the Cariboo Forest Region and the northeast Kamloops Forest Region. In the Cariboo Forest Region, it occurs primarily in the moist climatic transition east of the drier IDF and SBPS climates, and west of the wetter ICH and ESSFwk climates.

In the Cariboo Forest Region, the SBS Zone occurs primarily on gently to strongly rolling topography of the eastern Fraser Plateau. It occurs over a relatively wide elevation range from approximately 750 to 1350 m in the south, 450–1250 m in the northeast, and 750–1500 m in the northwest.

TABLE 14 Environmental characteristics of SBS subzones and variants in the Cariboo Forest Region[a]

	SBSdw1	SBSdw2	SBSmh	SBSmw	SBSmc1	SBSmc2[b]	SBSwk1[b]
Area (km^2)	3443	2567	789	1374	419	1205	1473
Elevation range (m)	750–1200	750–1200	450–750	700–1000	1250–1350	1200–1500	900–1250
Climate							
Precipitation (mm)							
Mean annual	585	487	559			575	719
Mean summer	286	252	257	328	298	229	334
Mean winter	298	235	297			354	429
Mean annual snowfall (cm)	182	198	197			237	240
Temperature(°C)							
Mean annual	3.7	3.4	4.6		2.9	1.5	2.4
Mean - warmest month	14.8	14.9	16.6	14.1		12.3	13.1
Mean - coldest month	-10.4	-11.0	-10.8			-12.6	-11.1
Frost-free days	152	170	179			151	117
Soils							
Zonal soils[c]	Br.G.L.	Br.G.L.	Br.G.L.	Br.G.L.	Br.G.L.	Br.G.L.	Br.G.L.
Zonal humus form[d]	HR (RM)	HR	HR, RM	HR (RM)	HR (RM)	HR (RM)	HR (RM)

[a] The SBSmm has a very small area (86 km^2) in the Cariboo Forest Region and is not included here. Refer to Lloyd *et al.* 1990.

[b] Climatic data are from the Prince George and/or Prince Rupert forest regions; few or no data are available from the Cariboo.

[c] Br.G.L. = Brunisolic Gray Luvisol

[d] HR = HemiMor; RM = MorModer

Climate The SBS Zone in the Cariboo Forest Region has a cool continental climate characterized by warm, moist summers and cool to cold, snowy winters. Mean annual temperatures range from 1.5 to 4.6°C (Table 14) with a general mean of about 3.7°C, which is similar to the IDF Zone. Frost can occur at any time of the year, especially in low-lying areas, but is less frequent than in the SBPS or MS zones. The similarity in temperatures between the SBS and IDF zones in the Cariboo Forest Region is a reflection of the location of the Cariboo Forest Region at the northern limit of the IDF Zone and the southern limit of the SBS Zone. In this area, mean climatic parameters for these two zones differ more in terms of precipitation than temperature. Mean annual precipitation in the SBS Zone ranges from about 487 to 719 mm. Peak precipitation periods are early summer and early winter. About 50% of the precipitation falls as snow. Maximum annual snowpacks are approximately 60–200 cm, with the deeper snowpacks at higher elevations in wetter subzones.

Vegetation Climax tree species on zonal sites in the SBS Zone are hybrid white spruce and subalpine fir. However, due to frequent wildfires in the past, climax stands are uncommon at low to moderate elevations (<1200 m). Lodgepole pine is the principal seral species throughout the zone. Douglas-fir is also a common seral species at low elevations (<1000 m) but it is seldom abundant at higher elevations. In contrast to the IDF Zone, mature Douglas-fir stands in the SBS are mostly single-storied and even-aged. Little Douglas-fir regeneration is present in these stands. Trembling aspen is also a common seral species in the Cariboo SBS but is less common than in other portions of the zone further north.

The forest undergrowth on zonal sites is characterized by a moderately well-developed shrub layer and a large number of shrub species. The herbaceous layer is variable. On the low to moderate elevations of the zone, the undergrowth is characterized by abundant pinegrass and a large number of forb species ranging from a few centimetres to a metre tall. Although mosses are abundant, their presence is often obscured by the herbaceous species. At higher elevations, fewer shrubs are present and the herbaceous layer is moderately to poorly developed. Mosses and low-growing forbs such as five-leaved bramble typically dominate the undergrowth at these elevations.

Small wetlands are common in the SBS Zone but less numerous and extensive than in the SBPS or IDF zones where drainage patterns are typically less well developed. They are predominantly fens. Bogs are present but much less common than in portions of the SBS Zone further north. Grasslands are uncommon and occur only locally on steep south-facing slopes.

Soils Soils of the SBS Zone in the Cariboo Forest Region are developed primarily on base-rich morainal deposits derived from weathering of local volcanic rock. Morainal deposits dominated by granitic rocks occur locally, especially in the Dragon Mountain and Mount Timothy areas. On zonal sites, the soils are predominantly Brunisolic Gray Luvisols with loamy texture and moderate (25–50%) content of gravels and cobbles. Brunisolic soils occur on well-drained sandy parent materials, while Gleysol and Organic soils occur on wet lower slopes and depressions.

Subzones and Variants of the SBS Zone in the Cariboo Forest Region

Ten subzones of the SBS Zone are recognized in British Columbia (Meidinger *et al.* 1991). Six of these, two with two variants each, occur within the Cariboo Forest Region.

SBSdw - Dry Warm SBS Subzone
  SBSdw1 - Horsefly Variant
  SBSdw2 - Blackwater Variant
SBSmh - Moist Hot SBS Subzone
SBSmw - Moist Warm SBS Subzone
SBSmm - Moist Mild SBS Subzone
SBSmc - Moist Cold SBS Subzone
  SBSmc1 - Moffat Variant
  SBSmc2 - Babine Variant
SBSwk - Wet Cool SBS Subzone
  SBSwk1 - Willow Variant

SBSdw Subzone The SBSdw is a relatively large subzone (approximately 6010 km^2 in the Cariboo Forest Region), which occurs on the gently rolling topography of the Fraser Plateau and southern Nechako Plateau near the southernmost limits of the SBS Zone. It extends from the southeastern portion of the Cariboo Forest Region (Bowers Lake area) northwestward to about the latitude of Prince George. Biogeoclimatic units bordering the SBSdw in the Cariboo Forest Region include the IDFdk along the drier, western portion of the subzone, the SBPSmk in colder areas, and the ICHmk3, ICHdk, SBSmw, and SBSmc1 along the wetter eastern portion. In terms of vegetation and climate, the SBSdw is transitional between the IDFdk and the ICHmk or SBSmw.

The SBSdw climate is relatively warm and slightly drier than the average for subzones of the SBS Zone in British Columbia. About half of the annual precipitation falls during the winter, and peak snowpack is generally about 1 m. The wettest period is typically late spring and early summer when thunderstorms are common.

Vegetation of the SBSdw has similarities to Douglas-fir and lodgepole pine forests of the IDF Zone to the west and south. It is distinguished from all other subzones of the SBS except the SBSmc by constant and often abundant pinegrass on zonal sites (Table 15). It is distinguished from the SBSmc by the absence of five-leaved bramble on zonal sites. Climax forests are very uncommon due to frequent stand-initiating wildfires but, where present, are dominated by hybrid white spruce, subalpine fir, and scattered Douglas-fir. Seral stands are dominated primarily by Douglas-fir and/or lodgepole pine, although trembling aspen is also common. Douglas-fir and lodgepole pine stands are mostly single-storied with sparse to moderately dense tree regeneration consisting of sparse Douglas-fir and spruce and often abundant subalpine fir. The shrub and herbaceous vegetation is floristically rich and productive. Several forbs, grasses, and low shrubs are abundant. Common shrubs include thimbleberry, black huckleberry, highbush-cranberry, birch-leaved spirea, soopolallie, and Sitka alder. Common herbaceous species include pinegrass, rough-leaved ricegrass, sarsaparilla, baneberry, twinflower, bunchberry, and queen's cup.

Two biogeoclimatic variants of the SBSdw occur in the Cariboo Forest Region. A third, the SBSdw3, occurs only in the Prince George Forest Region at the northern limits of the subzone.

The SBSdw1 Variant occupies the wetter, eastern portion of the SBSdw. It borders the ICH Zone in the south and the wetter subzones of the SBS Zone (SBSmc and SBSmw) in the north. Compared to the SBSdw2, the SBSdw1 zonal site vegetation has more vigorous and diverse shrub and herbaceous layers, subalpine fir is common in the understory, falsebox is present, and kinnikinnick is absent or incidental. Pinegrass is less abundant than in the SBSdw2.

TABLE 15 SBS vegetation table - zonal sites[a]

	Biogeoclimatic Unit	SBSdw1	SBSdw2	SBSmh	SBSmw	SBSmc1	SBSmc2	SBSwk1	
Tree Layer	*Pseudotsuga menziesii*	◇	◇	◇	◇				Douglas-fir
	Betula papyrifera		□	×					paper birch
	Pinus contorta	×	◇		×	◇	◇	□	lodgepole pine
	Picea engelmannii x *glauca*	×	■	●	×	●	■	◇	hybrid white spruce
	Abies lasiocarpa	□		□	●	●	□	×	subalpine fir
Shrub Layer	*Rosa acicularis*	●	●	■	■		□		prickly rose
	Cornus stolonifera	□		■	□				red-osier dogwood
	Mahonia aquifolium	■	□	■	■				tall Oregon-grape
	Amelanchier alnifolia	●	●	●	■			■	saskatoon
	Lonicera involucrata	■	■	●	■	□	□	●	black twinberry
	Corylus cornuta			×					beaked hazelnut
	Spiraea betulifolia	●	●	●	●	●	●	□	birch-leaved spirea
	Pachistima myrsinites	●			●	■			falsebox
	Viburnum edule	■	■	●	■			■	highbush-cranberry
	Rubus parviflorus	×		×	■	□		■	thimbleberry
	Vaccinium membranaceum	●	□		●	●	×	●	black huckleberry
	Ribes lacustre			■	■	■		●	black gooseberry
Herb Layer	*Elymus glaucus*	■		□					blue wildrye
	Calamagrostis rubescens	●	×			●	●		pinegrass
	Aralia nudicaulis	×	■	■	■				wild sarsaparilla
	Chimaphila umbellata	●	■	□	■				prince's pine
	Rubus pubescens	■	□	■	■				trailing raspberry
	Aster conspicuus	●	■	●	●				showy aster
	Oryzopsis asperifolia	■	●	●	□				rough-leaved ricegrass
	Lathyrus ochroleucus	□	□	●	□				creamy peavine
	Arnica cordifolia	■	■	□	●	●	●		heart-leaved arnica
	Cornus canadensis	×	●	●	×	×	■	×	bunchberry
	Linnaea borealis	●	■	×	■	●	●	●	twinflower
	Clintonia uniflora	●		□	■	■		●	queen's cup
	Gymnocarpium dryopteris				□			◇	oak fern
	Streptopus roseus				□	□		●	rosy twistedstalk
	Rubus pedatus					■	●	●	five-leaved bramble
	Veratrum viride							●	Indian hellebore
Moss Layer	*Rhytidiadelphus triquetrus*	●	■	●	×			●	electrified cat's-tail moss
	Pleurozium schreberi	◇	◇	●	◇	◇	◇	◇	red-stemmed feathermoss
	Ptilium crista-castrensis	×	◇	□	◇	◇	◇	◇	knight's plume
	Peltigera aphthosa	□	■		●	■	●	□	freckle pelt
	Hylocomium splendens	□	×	□	×			×	step moss
	Mnium spp.			■	□			×	leafy mosses
	Barbilophozia spp.							■	leafy liverworts

[a] Data are for zonal sites only.

Species abundance: □ present in 40–60% of plots surveyed; ■ >60% of plots, mean cover <1%; ● >60% of plots, mean cover 1–7%; × >60% of plots, mean cover >7–15%; ◇ >60% of plots, mean cover >15%

The SBSdw2 Variant occurs primarily in the central and northern portion of the SBSdw in a band between the SBSdw1 and either the IDF or SBPS. Compared to the SBSdw1, lodgepole pine stands are more common, pinegrass is more abundant, subalpine fir regeneration is less common, kinnikinnick is common, and fewer shrub and tall forb species are present. The SBSdw2 is the SBS unit most similar to the IDFdk.

SBSmh Subzone The SBSmh Subzone occurs on the lower slopes and valley floors of the Fraser River valley, north of Alexandria, and the Quesnel River valley, downstream of about Quesnel Forks. It is the lowest-elevation subzone of the SBS in the Cariboo Forest Region. Upper elevation limits are near 750 m, where the SBSmh borders the SBSdw or SBSmw.

The SBSmh is the warmest subzone of the SBS in the Cariboo Forest Region (mean annual temperature 4.6°C) and is a principal agricultural area of the Region. Precipitation is similar to or slightly greater than that of the SBSdw.

The SBSmh zonal vegetation is distinguished from that of other subzones of the SBS Zone in the Cariboo Forest Region by the abundance of tall shrubs, such as red-osier dogwood and Douglas maple, presence of beaked hazelnut, and absence or very low abundance of pinegrass as well as species most commonly found in snowier climates, such as five-leaved bramble. The forest canopy of late seral to climax forests on zonal sites is dominated by hybrid white spruce, together with some subalpine fir and scattered Douglas-fir. Seral stands are primarily Douglas-fir, trembling aspen, and/or white birch. Most seral stands are single-storied. Deciduous forests of trembling aspen and/or white birch, often mixed with Douglas-fir, hybrid white spruce, and subalpine fir, occupy a large proportion of the SBSmh landscape, due partly to frequent wildfires and harvesting in the past. Lodgepole pine is infrequent in the SBSmh and restricted primarily to local areas of sandy soils.

Mature Douglas-fir forests on zonal sites have a diverse, relatively well-developed shrub layer. Common species include red-osier dogwood, highbush-cranberry, saskatoon, prickly rose, soopolallie, Douglas-maple, and beaked hazelnut. The herbaceous and bryophyte/lichen layers are often sparse, especially in stands with a closed canopy. Deciduous forests in the SBSmh have a very productive undergrowth with numerous shrub and herbaceous species.

The SBSmh bordering the Fraser River is the most culturally developed subzone of the Cariboo Forest Region. The forest has been cleared for agricultural purposes from many valley bottom and low terrace sites.

SBSmw Subzone The SBSmw Subzone occurs in the northeastern portion of the Cariboo Forest Region, east of the Fraser River and north of the Quesnel River. It occurs on the middle and upper slopes of these river valleys as well as eastward across the northeastern Fraser Plateau as it rises toward the Quesnel Highland. Highest elevations of the SBSmw are about 950–1000 m, where the SBSmw borders the wetter, colder SBSwk subzone. Lowest elevations of the SBSmw are bordered by the SBSmh at about 750 m. A nearly equal area of the SBSmw occurs in the Cariboo and Prince George forest regions.

Climate of the SBSmw is moderately warm and moist. It is slightly wetter than that of the SBSdw.

The SBSmw vegetation is distinguished from that of other SBS subzones in the Region by frequent Douglas-fir and queen's cup but little or no pinegrass, oak fern, or beaked hazelnut on zonal sites. Five-leaved bramble is much less common than in wetter climates with a higher snowpack, such as the SBSwk and SBSmc.

Climax forests of the SBSmw are dominated by hybrid white spruce and subalpine fir. However, as in most other subzones on the Fraser Plateau, climax forests are uncommon due to past wildfires. Seral forests are dominated by a mixture of Douglas-fir, lodgepole pine, hybrid white spruce, and subalpine fir. Trembling aspen and white birch are also common. Douglas-fir and lodgepole pine forests are primarily single-storied. Tree regeneration is predominantly subalpine fir with secondary spruce and Douglas-fir. The shrub layer is moderately well developed and includes saskatoon, falsebox, thimbleberry, and Douglas maple. Several forbs (including queen's cup, bunchberry, twinflower, sarsaparilla, and showy aster) are present in the undergrowth, but, in contrast to the SBSdw, grasses are a minor component.

SBSmm Subzone The SBSmm Subzone occurs primarily in the Kamloops Forest Region and has only a very small area (86 km^2) in the Cariboo Forest Region, near Bowers Lake. It is very similar to the SBSmc, described below, and differs from it by having more falsebox, black twinberry, palmate-leaved coltsfoot, and stiff clubmoss. See Lloyd *et al.*(1990).

SBSmc Subzone In the Cariboo Forest Region, the SBSmc occurs primarily on localized heights-of-land above the SBSdw, SBPSmk, or SBPSdc. Locations include Timothy Mountain, Dragon Mountain, and the low summits in the Blackwater–Nazko area. The elevation range of the SBSmc is generally 1200–1350 m east of the Fraser River and 1250–1500 m in the drier areas west of the Fraser River. A large area of the SBSmc occurs in the Prince George and Prince Rupert forest regions.

The SBSmc has a cool, moist climate, which is cooler than that of other SBS subzones in the Cariboo Forest Region, with the exception of the SBSwk.

The SBSmc is distinguished from the SBSdw, SBSmh, and SBSmw by the presence on zonal sites of species characteristic of moist, relatively snowy climates, such as five-leaved bramble, rosy twistedstalk, bluejoint, and red elderberry. It is distinguished from vegetation of the SBSwk by the absence of oak fern on zonal sites. Climax forests, dominated by hybrid white spruce and subalpine fir, are more common than in the SBSdw, SBSmh, or SBSmw but less common than in the SBSwk. Lodgepole pine is the predominant forest type and is the principal seral tree species. Douglas-fir forests are common in the SBSmc east of the Fraser River, especially on warm slope aspects, but are virtually absent west of the Fraser River. Deciduous forests, mostly trembling aspen and white birch, are relatively uncommon.

The undergrowth includes a sparse to moderate cover of shrubs and herbaceous species and a well-developed moss layer. Common shrubs are black huckleberry, birch-leaved spirea, and black gooseberry. Principal mosses are red-stemmed feathermoss and knight's plume.

The SBSmc includes two biogeoclimatic variants in the Cariboo Forest Region:

The SBSmc1 Variant occurs east of the Fraser River from the Bowers Lake area in the southeastern corner of the Region to Dragon Mountain near Quesnel. Based on vegetation, the climate is probably somewhat warmer than that of the SBSmc2. The vegetation on zonal sites differs from that of the SBSmc2 by the frequent presence of falsebox in the undergrowth.

The SBSmc2 Variant occurs locally west of the Fraser River on the summits of hills in the Blackwater and Nazko areas. It has a much larger area in the Prince Rupert and Prince George regions, where it also occurs on plateau landscapes. The absence of Douglas-fir and greater abundance of cool-, snowy-climate species such as five-leaved bramble, indicates that the climate of the SBSmc2 is cooler than that of the SBSmc1.

SBSwk1 Variant The SBSwk in the Cariboo Forest Region occurs along the moist eastern edge of the Fraser Plateau and on lower valley slopes in the dissected topography of the adjacent Quesnel Highland, north of the Cariboo River. It occurs between 900 and 1250 m and borders the ESSFwk1 at higher elevations and the SBSmw at lower elevations. A large area of the SBSwk also occurs in the adjacent portions of the Prince George Forest Region. The SBSwk is distinguished from the SBSmw and SBSmc by abundant oak fern on zonal sites and from other SBS subzones of the Cariboo Forest Region by the presence of species characteristic of moist, relatively snowy climates, such as five-leaved bramble, rosy twistedstalk, and Indian hellebore.

The SBSwk has the wettest, snowiest climate of the SBS Zone in the Cariboo Forest Region.

Old forests of hybrid white spruce and subalpine fir are common on the SBSwk landscape. These forests have a moderate cover of shrubs and herbaceous species and a well-developed moss layer. Principal shrub species are black huckleberry, black gooseberry, black twinberry, and thimbleberry. Lodgepole pine is the principal seral species following wildfire and covers a large proportion of the landscape. Douglas-fir and deciduous species are uncommon.

The SBSwk1 Variant is the only biogeoclimatic variant of the SBSwk in the Cariboo Forest Region.

6 SITE UNITS OF THE CARIBOO FOREST REGION

Guide to Site Unit Descriptions

This section describes the forested site units (site series and phases) of the biogeoclimatic subzones and variants described in Section 5. Forested site units are considered to be those in which the mature vegetation includes 10% or greater ground cover of trees at least 10 m tall. Non-forested site units (wetlands, grasslands, shrublands, etc.) are not described in detail in this guide and will be described separately in other guides.

This section contains one subsection for each biogeoclimatic unit. The subsections are ordered alphanumerically by zone, subzone, and variant. Each subsection has its own page numbering sequence in which the first part of the number is the subsection number and the second part is the page sequence within the subsection.

Following a brief introduction describing the location and elevation range of the biogeoclimatic unit, each subsection contains the following information.

Distinguishing Adjacent Units from the Biogeoclimatic Unit

This section is included in order to ensure that the biogeoclimatic classification of the site under consideration is correctly identified. Preliminary identification of the biogeoclimatic unit may be accomplished with a biogeoclimatic map available from the Research Section of the Cariboo Forest Region. However, if the site is near the boundary between two or more biogeoclimatic units or there is some question regarding correct biogeoclimatic classification, this section can be used to confirm the identification. All biogeoclimatic units that share a border with the selected biogeoclimatic unit are listed, and vegetation attributes that they have but are not present in the selected biogeoclimatic unit are described. It must be noted that the criteria for distinguishing biogeoclimatic units apply primarily to mature vegetation on zonal sites. If the site under examination is not a zonal site or does not have mature vegetation, adjacent zonal sites with mature vegetation should be examined before applying the criteria. The vegetation attributes listed are the principal criteria used to develop the biogeoclimatic map for the Cariboo Forest Region.

Site Units of the Biogeoclimatic Unit

This section provides a brief narrative description of each of the forested site series of the biogeoclimatic unit, focusing on principal site features, structure of the mature vegetation, and vegetation features that distinguish it from other site series. The purpose of this section is to briefly provide field staff with our concept of the particular site series so that they are better able to correctly identify it using the key and other tools.

Key to Site Units of the Biogeoclimatic Unit

This section is a tool for identification of site units, focusing primarily on site features and secondly on vegetation features. Where vegetation features are used they are intended to be used in mature forest vegetation and should be used with caution in early seral (recently harvested or burned) or immature vegetation. The key is dichotomous and presents the user with sets of two choices. Selecting the correct one of the two choices leads eventually to the site series name. Most choices include two or more attributes such as moisture regime, soil texture, and vegetation species. These attributes are generally listed in decreasing order of importance for site identification. If there are contradictions between attributes (such as when the first applies but the second does not), the first attributes should be given precedence. In all cases, however, all attributes should be assessed and if there are contradictions this may indicate a site transitional between two or more site series.

Edatopic Grid

The edatopic grid shows the typical range of relative moisture regime and relative nutrient regime for each site unit. This grid is an aid to site series identification but should be used for this purpose only in combination with other tools, particularly the key. Absolute moisture regime may be determined from relative moisture regime in Appendix 5.

Landscape Profile

The landscape profile displays the generalized relative position of each forested site series (numbers shown below the profile) on a conceptualized topographic profile. The profile indicates slope position, slope aspect, slope gradient, and dominant soil particle size classes. The overall form of the profiles varies to reflect, in part, typical topography for the biogeoclimatic unit. The tree symbols have been selected to represent a typical forest canopy composition but should be used with caution since considerable variability is often present.

Site Features of the Site Series

This table is intended as an aid to confirming that the site series has been correctly identified. It should be used after preliminary site identification to ensure that site attributes are within the range normally found in the site series. If they are not, identification of the site series should be rechecked or the site should be noted as an atypical representative of the site series.

The first line of the table describes key features. These are considered to be the principal broad site features that may be used to distinguish the site series from others in the biogeoclimatic unit.

The soil texture given for the site series describes the typical broad texture class found in the site series. Sand includes sand and loamy sand texture classes; loamy includes sandy loam, loam, sandy clay loam, and clay loam; silty includes silt, silt loam, and silty clay loam; and clayey includes clay, silty clay, sandy clay, and heavy clay. "Gravelly" is used as a modifier to indicate that gravel content is greater than 15%.

Humus form terminology follows Klinka *et al.* (1981). The humus form classification and terminology of Klinka *et al.* (1981) have recently been updated by Green *et al.* (1993). However, we have presented our humus form information consistent with the classification under which it was collected (Klinka *et al.* 1981) in order to avoid possible ambiguity and the need to reassess individual plot data.

Occurrence is subjectively described as predominant (dominates landscape, often includes >50% of area), common (frequently encountered but not predominant), or uncommon. Size describes the general size of sites from large (generally >10 ha) to moderate (generally 1–10 ha) to small (generally <1 ha). These are presented only as rough descriptions to convey a general sense of the size of the unit. Distribution is described as wide (distributed throughout the biogeoclimatic unit) or by reference to a geographic area where it is primarily located.

Vegetation Table

This table shows in semi-graphic form the abundance of each of several selected species in tree (>10 m), shrub (<10 m), herb (herbs and dwarf shrubs), and moss (bryophytes and lichens) layers in each site unit. All species included in this table occurred in at least 40% of the plots from at least one site series. In addition, the species were selected to include those that have indicator value for a site series or group of site series, or are especially important for describing the vegetation due to their high abundance in two or more site series. It must be realized that many additional species are also common and may be very abundant on some sites.

Silviculture interpretations and considerations for each site unit are contained in Section 7 — Silviculture Considerations.

AT
ALPINE TUNDRA ZONE

The Alpine Tundra Zone (including the alpine parkland forests) covers a relatively large area (6687 km^2) in the Cariboo Forest Region. It is most extensive in the Coast Mountains (Pacific and Chilcotin ranges) and Quesnel Highland, but is also present in the Cariboo Mountains, Itcha and Ilgachuz ranges, Marble Range, and Camelsfoot Range. On the map of biogeoclimatic units of the Cariboo Forest Region, it includes both the treeless alpine tundra and the parklands where islands of trees occur in a matrix of alpine tundra communities. The parklands are a transition between the forest-dominated landscapes of the ESSF and the treeless landscapes of the alpine tundra. Elevations of the AT (including the parklands) are mostly above 1800 m in the Quesnel Highland and Cariboo Mountains and 2100 m in the Coast Mountains and Itcha and Ilgachuz ranges.

The AT Zone has not been sufficiently well studied to document biogeoclimatic subzones or site series, either forested or non-forested.

Distinguishing Adjacent Units from the AT

The **ESSF** Zone occurs below the AT zone in all parts of the Cariboo Forest Region except very locally in the Homathko River and Mosley Creek valleys near the border with the Vancouver Forest Region. In this small area, the **MH** Zone (MHmm2) occurs below the AT. ESSF subzones and variants that occur below the AT in the Cariboo Forest Region are the ESSFwc3, ESSFxv1, ESSFxv2, ESSFxc, and ESSFdc2.

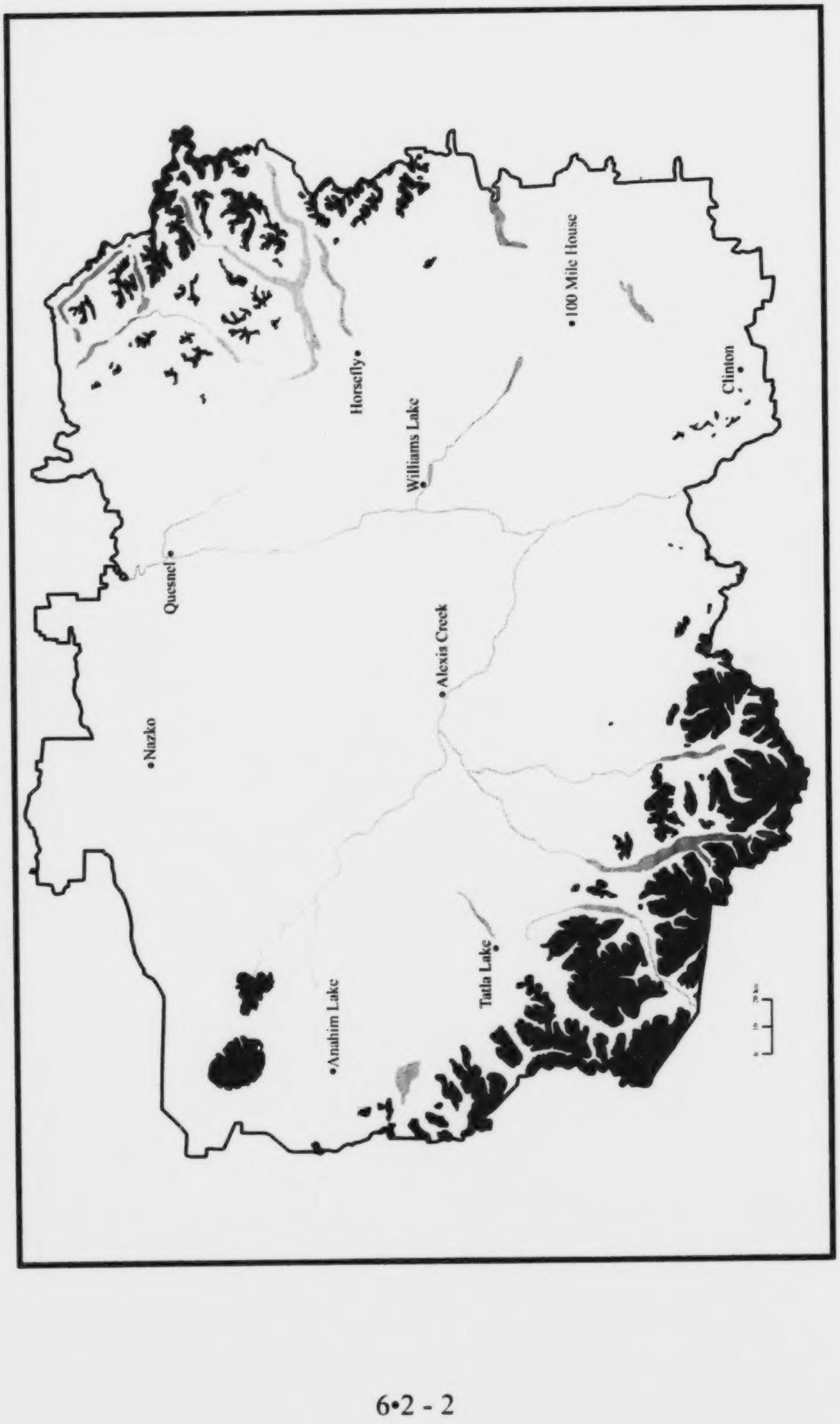
In the **ESSF** and **MH**, zonal sites are:

- predominantly forested; tree canopy may be closed to very open but is relatively continuous (on zonal sites) and mostly 10 m or more tall.

Site Series of the AT Zone

Insufficient data are currently available to classify or describe forested site series of the AT Zone. Forested site series have a limited extent in the AT Zone, and are found predominantly or relatively warm, dry sites at lower elevations of the zone.

Distribution of AT Zone in the Cariboo Forest Region


Nazko
Quesnel
Horsefly
Williams Lake
100 Mile House
Clinton
Alexis Creek
Tatla Lake
Anahim Lake
0 10 20 km

BGxh3
BUNCHGRASS VERY DRY HOT SUBZONE FRASER VARIANT

The BGxh3 is a relatively small (269 km^2) variant located almost entirely within the Cariboo Forest Region. It includes the lower slopes and terraces of the Fraser River valley south from the confluence of the Chilcotin River to about the border with the Kamloops Forest Region, where it is replaced by the BGxh2. Elevations are from valley bottom (approximately 500 m) to approximately 650 m.

Distinguishing Adjacent Units from the BGxh3

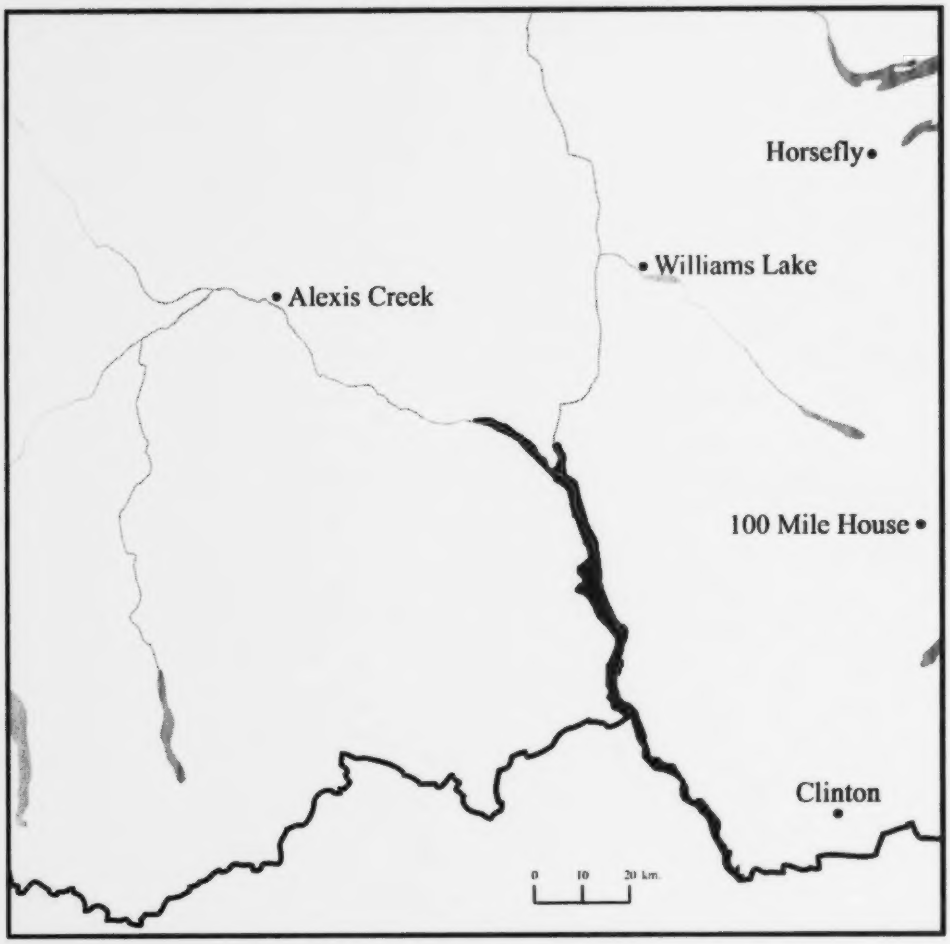
The **BGxw2** occurs at elevations above the BGxh3 throughout most of its distribution. South of Big Bar Creek, however, the **IDFxw** borders the upper elevations of the BGxh3. In this area, the BGxw2, which normally lies above the BGxh3, is pinched out due to the steep slopes on the west side of the Edge Hills.

In the **BGxw2**, climax vegetation on zonal sites has:
- little or no big sagebrush;
- less prickly pear cactus;
- smaller relative abundance of junegrass;
- greater relative abundance of needle-and-thread grass;
- greater diversity and total cover of vascular plants.

moist sites have:
- frequent porcupine grass and occasional spreading needlegrass.

In the **IDFxw**, zonal sites have:
- Douglas-fir forests as climax vegetation;
- common pinegrass, soopolallie, and kinnikinnick.

Distribution of BGxh3 Variant in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0
10
20 km.

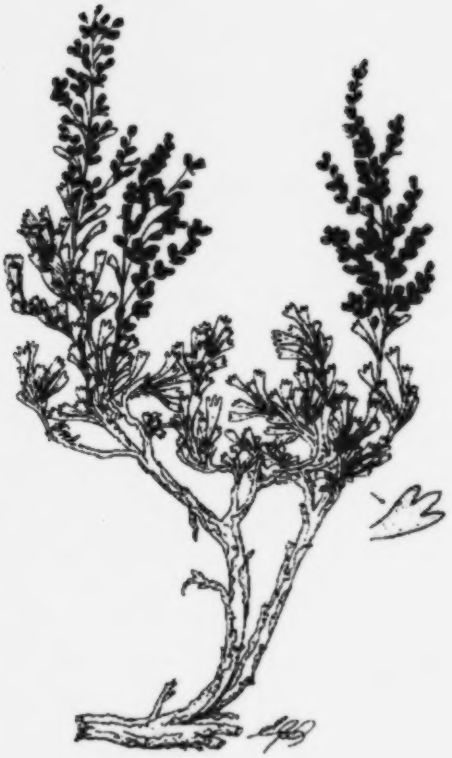
Site Units of the BGxh3

A classification of forested sites in the BGxh3 is not available at the present time but will be prepared for incorporation into this guide in the near future.

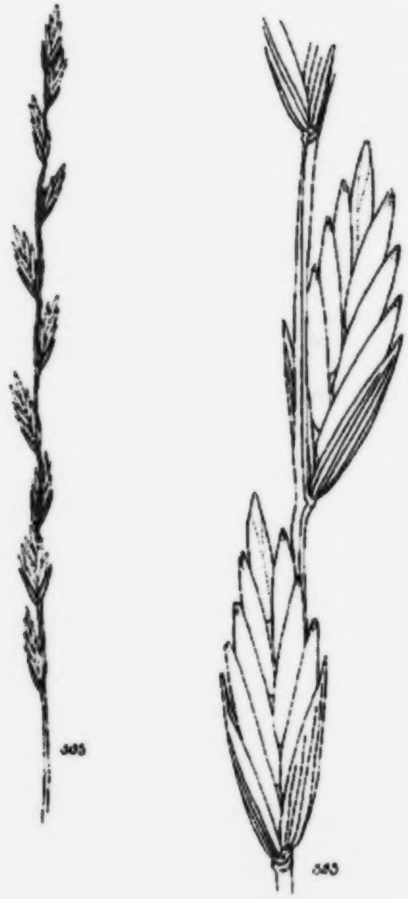
Zonal Sites Zonal sites are less common in the BGxh3 than in many other biogeoclimatic units due to the prevalence of steep slopes and the frequent occurrence of coarse soils. The zonal site series occurs on gentle to moderate slopes with loamy soils and on the frequent fluvial terraces that are present in the valley. The vegetation is dominated by bluebunch wheatgrass, big sagebrush, and junegrass. Large clumps of prickly pear cactus are common. Needle-and-thread grass is also common and often increases following disturbance. Ground lichens cover 30–80% of the soil surface, with principal species being *Cladonia cariosa, C. pyxidata*, and *C. symphicarpa*. Mosses (including *Tortula ruralis* and *Hypnum* spp.) and cyanobacteria are interspersed with the lichens.

Drier Sites Sites drier than zonal sites are very common and occur on hill crests, steep slopes, shallow soils over bedrock, moderate south- and west-facing slopes, and sandy or gravelly soils. Although these sites have grassland vegetation, they frequently have scattered Douglas-fir and, south of Churn Creek, ponderosa pine. Common species on drier sites include bluebunch wheatgrass, big sagebrush, rabbit-brush, sand dropseed, pasture sage, and needle-and-thread grass.

Wetter Sites Sites wetter than the zonal site series include moist gullies, depressions, streamside riparian sites, and cool north and east aspects. These sites often have Douglas-fir forests. Those occurring in moist draws and ravines and along larger watercourses have a Douglas-fir canopy and a shrubby undergrowth that includes Douglas maple, common snowberry, rose, water birch, and several forbs and grasses. Black cottonwood forests with a shrubby undergrowth are scattered along the Fraser and Chilcotin rivers. Douglas-fir forests on steep north and east aspects generally have moderate to high cover of bluebunch wheatgrass, junegrass, yarrow, mosses, and ground lichens.



Big sagebrush
Artemisia tridentata



Bluebunch wheatgrass
Elymus spicatus

BGxw2
BUNCHGRASS VERY DRY WARM SUBZONE
ALKALI VARIANT

The BGxw2 is a relatively small (627 km^2) variant, which is included entirely within the Cariboo Forest Region. It occurs on middle and upper valley slopes and terraces of the Fraser River valley from Sheep Creek south to about the boundary of the Kamloops Forest Region. It also occurs in the lower Chilcotin River valley east of Hanceville. At its northern and western limits, the BGxw2 occurs from valley bottoms to middle-elevation slopes. Elevations are approximately 650–900 m in most areas.

Distinguishing Adjacent Units from the BGxw2

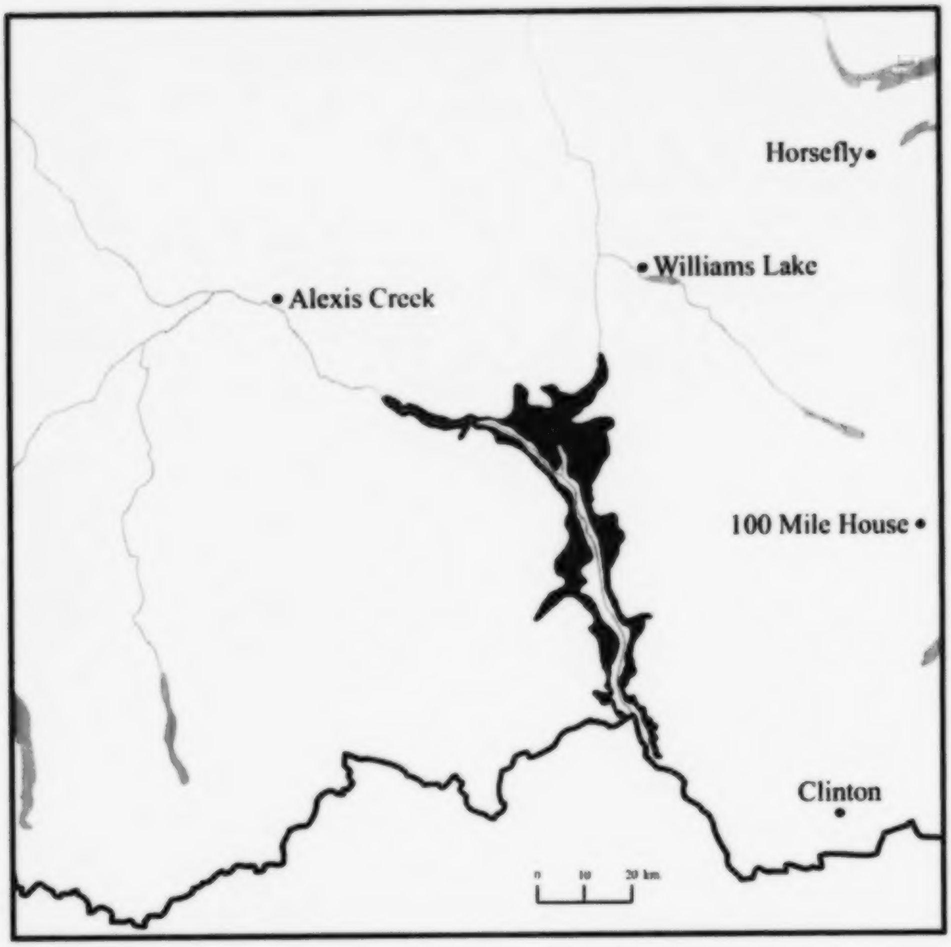
The **BGxh3** occurs below the BGxw2 throughout most of its distribution except where the BGxw2 extends to valley bottoms. The **IDFxm** occurs above the BGxw2 on upper valley slopes and the adjacent plateau throughout the range of the BGxw2.

In the **BGxh3**, climax vegetation on zonal sites has:
- big sagebrush and more abundant prickly pear cactus;
- greater relative cover of junegrass;
- smaller relative cover of needle-and-thread grass;
- lower total vascular plant cover and species diversity.

moist sites have:
- little or no porcupine grass or spreading needlegrass.

In the **IDFxm**, zonal sites have:
- Douglas-fir forests as climax vegetation;
- common pinegrass.

Distribution of BGxw2 Variant in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0 10 20 km

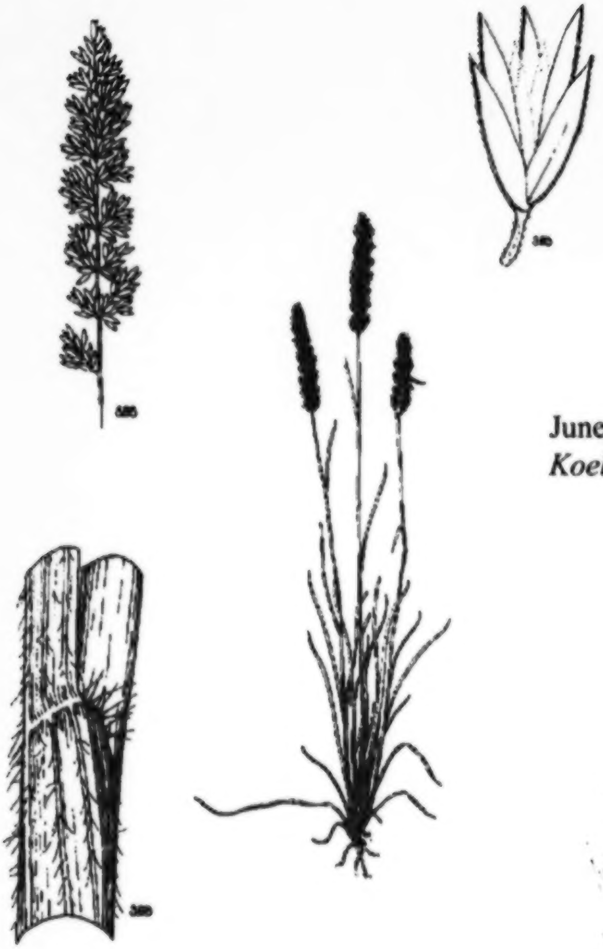
Site Units of the BGxw2

A classification of forested sites in the BGxw2 is not available at the present time but will be prepared for incorporation into this guide in the near future.

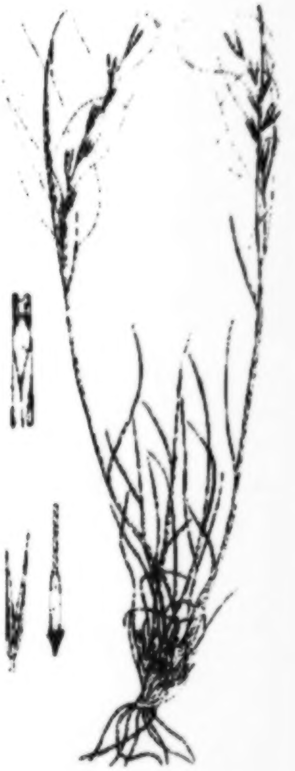
Zonal Sites Zonal sites include level to gently sloping sites on all aspects and on some steeper east and northwest aspects. The vegetation is dominated by bluebunch wheatgrass and needle-and-thread grass, with a combined cover of 35–75%. Several other herbaceous species are present and include pasture sage, junegrass, meadow salsify, brittle prickly-pear cactus, Holboell's rockcress, western blue flax, large-fruited desert-parsley, and pale comandra. The lichen community on late-seral and climax zonal sites is usually diverse and forms a well-developed (25–70% cover) crust on the soil, covering most of the ground not occupied by vascular plants. Principal lichen species are *Cladonia pyxidata* and *C. cariosa*.

Drier Sites Sites drier than those of the zonal site series are relatively common in the BGxw2 on hill crests, shallow soils over bedrock, steep slopes, moderate south- and west-facing slopes, and sandy soils. The vegetation includes many of the same species found on zonal sites but they are less abundant. Common species include pasture sage, pussy-toes, prickly-pear cactus, junegrass, large-fruited desert-parsley, and needle-and-thread grass. Total cover of mosses, lichens, and algae varies from 15 to 90%. Although these sites are predominantly grasslands, they frequently include scattered Douglas-fir and occasionally have open forests.

Wetter Sites Sites wetter than the zonal site series include moist gullies, depressions, streamside riparian sites, and moderate to steep north and east aspects. They are frequently forested. Moist draws and ravines and sites along larger watercourses often have a Douglas-fir–dominated forest with a shrubby undergrowth that often includes Douglas maple, common snowberry, rose, water birch, scattered forbs and grasses, and relatively high cover of mosses. Black cottonwood forests with a shrubby undergrowth are scattered on some incised drainages. Steep north- and east-facing slopes are often vegetated by moderately open Douglas-fir forests and generally contain moderate to high covers of bluebunch wheatgrass as well as spike-like goldenrod, nodding onion, junegrass, and yarrow, and a relatively high cover of mosses and ground lichens.



Junegrass
Koeleria macrantha



Needle-and-thread grass
Stipa comata

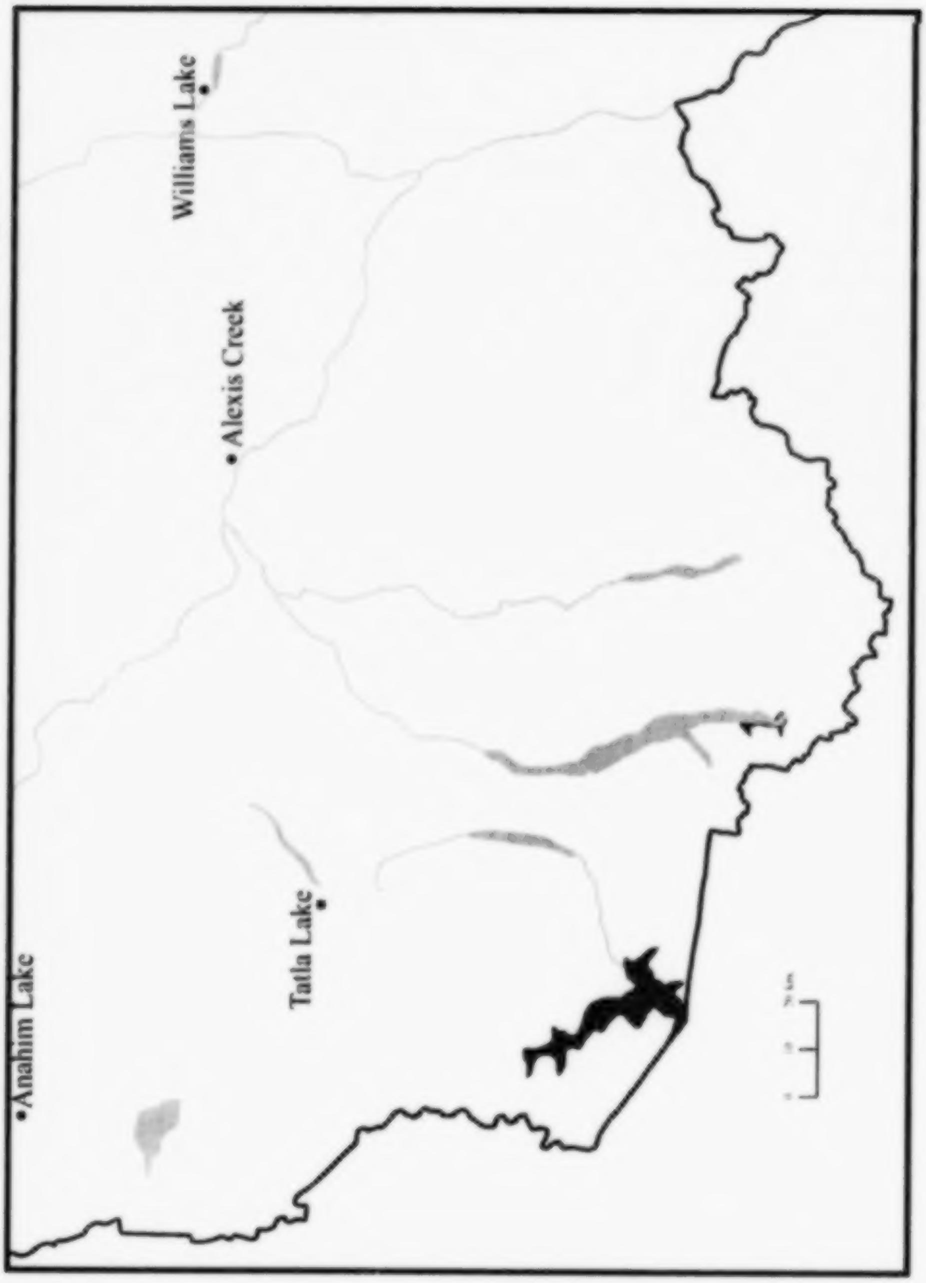
CWH
COASTAL WESTERN HEMLOCK ZONE

The CWH Zone has a very small total area (283 km^2) in the Cariboo Forest Region, where it occurs in valley bottoms and on lower slopes at the confluence of Mosley Creek and the Homathko River, near the border with the Vancouver Forest Region. It also includes a small area at the southern end of Chilko Lake in Ts'yl-os Provincial Park. The CWH in the Cariboo Forest Region has not been sufficiently inventoried to assess subzone boundaries or site series representation. However, based on surveys in adjacent areas of the Vancouver Forest Region, two subzone variants, the CWHds1 (Dry Submaritime Subzone, Southern Variant) and CWHms1 (Moist Submaritime Subzone, Southern Variant) are probably present in the Cariboo Forest Region. Both are at the limits of their Interior extent and are much more extensive in the coastal environments of the Vancouver Forest Region. The CWHds1 likely occurs in valley bottoms, while the CWHms1 likely occurs on side slopes above the CWHds1 and bordering the MH Zone at higher elevations. The CWHms1 probably does not extend as far up the Mosley Creek and Homathko River valleys as does the CWHds1. Elevations of the CWH Zone in this Region are from valley bottom to approximately 1200 m.

Distinguishing Adjacent Units from the CWH (Cariboo Forest Region only)

The **MHmm2** occurs above the CWH Zone in the Homathko River valley and adjacent lowest portions of the Mosley Creek valley. The **ESSFxv1** occurs above the CWH Zone further up the Mosley Creek valley and at the southern end of Chilko Lake. Further into the Cariboo Forest Region, where the coastal influence on the climate is lessened, the **IDFdw** replaces the CWH on lower slopes of the Homathko River and Mosley Creek valleys. The IDFdw also replaces the CWH Zone along most of the Chilko Lake shoreline.

Distribution of CWH Zone in the Cariboo Forest Region


Williams Lake
Alexis Creek
Tatla Lake
Anahim Lake

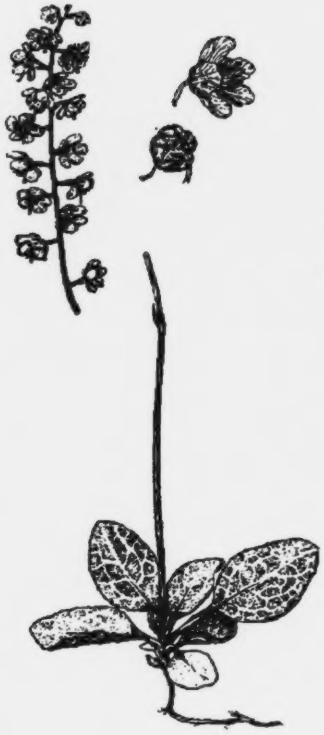
In the **MHmm2**, zonal sites have:
- mountain hemlock;
- little or no Douglas-fir or redcedar.

In the **ESSFxv1**, zonal sites have:
- grouseberry and cladonia lichens;
- common subalpine fir, Engelmann spruce, and grouseberry;
- little or no western hemlock or redcedar.

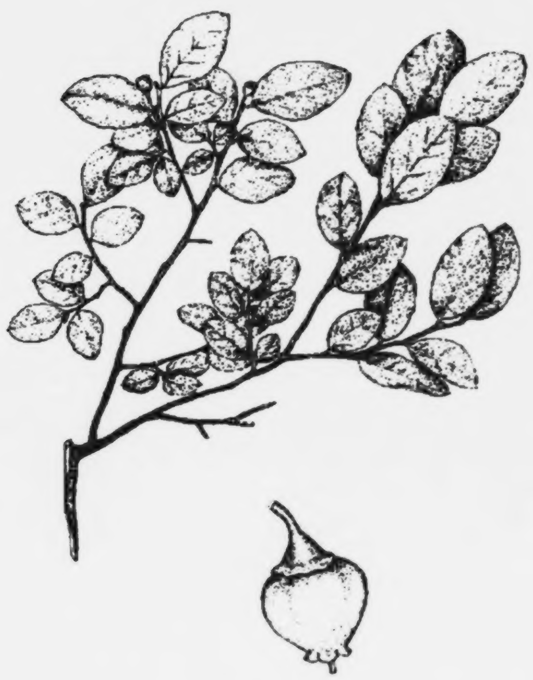
In the **IDFdw**, zonal sites have:
- little or no western hemlock or redcedar;
- soopolallie, pinegrass, and often kinnikinnick.

Site Units of the CWH

Site units of the CWHds1 and CWHms1 have been described for the Vancouver Forest Region by Green and Klinka (1994). Separate classifications have not been prepared for the Cariboo Forest Region nor has the Vancouver Region classification been tested in the Cariboo Forest Region. However, it is anticipated that the Vancouver Region classifications are generally applicable to the Cariboo Forest Region. Due to the current lack of information on the boundary between the CWHds1 and CWHms1 in the Cariboo Forest Region, any site identification efforts in this Region should consider both the CWHds1 and CWHms1 classifications.



White-veined wintergreen
Pyrola picta



Alaskan blueberry
Vaccinium alaskaense

ESSFdc2
ENGELMANN SPRUCE–SUBALPINE FIR
DRY COLD SUBZONE
THOMPSON VARIANT

The ESSFdc2 includes a very small portion (approximately 196 km^2) of the Cariboo Forest Region on the tops of low mountains south of Canim Lake and east of Bowers Lake. Elevations are generally 1400–1900 m. The ESSFdc2 occurs primarily in the Kamloops Forest Region south of Lytton, west of the Okanagan Valley, and at high elevations along the North Thompson River valley.

Distinguishing Adjacent Units from the ESSFdc2

The **SBSmc1** occurs at elevations below the ESSFdc2 on the gently rolling, relatively cold landscapes at the eastern edge of the Fraser Plateau, south of Bowers Lake. The **SBSmm** occurs below the ESSFdc2 in the more dissected terrain and milder climate associated with the North Thompson River valley. The **SBSdw1** occurs below the ESSFdc2 on small, isolated hills west of Bowers Lake, and the **MSxk** occurs below a small area of the ESSFdc2 in the dry climate near Bonaparte Lake. The **AT** Zone occurs above the ESSFdc2.

In the **SBSmc1**, zonal sites have:
- no white-flowered rhododendron, grouseberry, or Sitka valerian.

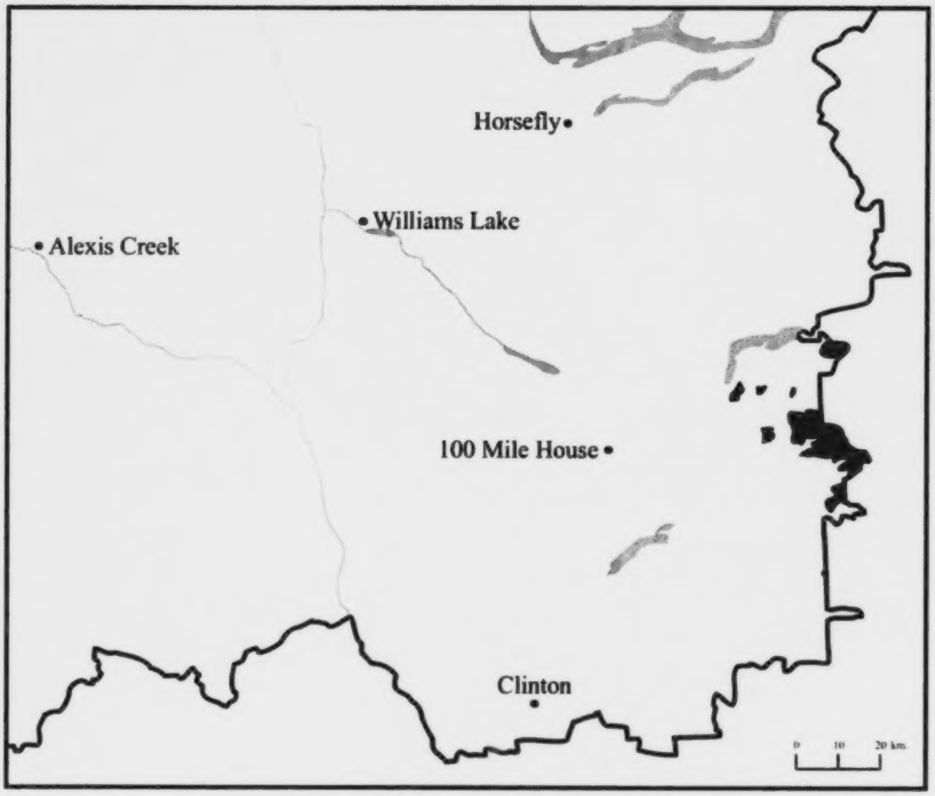
In the **SBSmm**, zonal sites have:
- no white-flowered rhododendron, grouseberry, or Sitka valerian;
- common falsebox.

In the **SBSdw1**, zonal sites have:
- no white-flowered rhododendron, grouseberry, or Sitka valerian;
- very common Douglas-fir and pinegrass.

In the **MSxk**, zonal sites have:
- no white-flowered rhododendron or Sitka valerian;
- abundant pinegrass.

In the **AT**, zonal sites have:
- no continuous forest cover;
- no white-flowered rhododendron.

Distribution of ESSFdc2 Variant in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0 10 20 km

Site Units of the ESSFdc2

Site units of the ESSFdc2 in the Kamloops Forest Region are described by Lloyd *et al.* (1990). These descriptions generally apply to the ESSFdc2 in the Cariboo Forest Region as well and have been summarized here. Consult the guide to ecosystems of the Kamloops Forest Region (Lloyd *et al.* 1990) for a description of these site units.

ESSFmv1
ENGELMANN SPRUCE–SUBALPINE FIR MOIST VERY COLD SUBZONE NECHAKO VARIANT

The ESSFmv1 includes a very small area (12 km^2) of the Cariboo Forest Region near the confluence of the Nazko and Blackwater rivers. Here it occurs on the summits of high hills at elevations above approximately 1400 m. The ESSFmv1 is much more extensive in the southwest portion of the Prince George Forest Region from Stuart Lake in the north to the Naglico Hills in the south (DeLong *et al.* 1993).

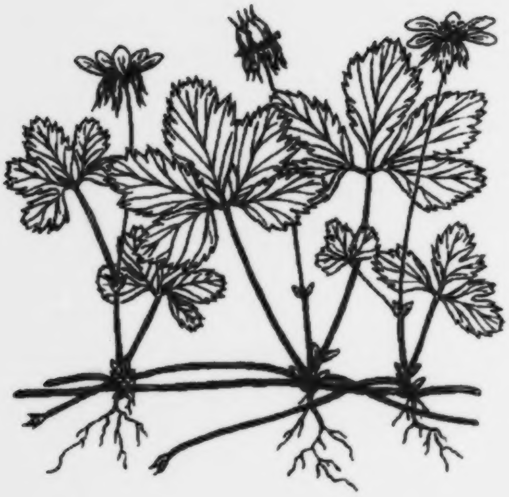
Distinguishing Adjacent Units from the ESSFmv1 (Cariboo Forest Region only)

The **SBSmc2** occurs at elevations below the ESSFmv1 in the Cariboo Forest Region.

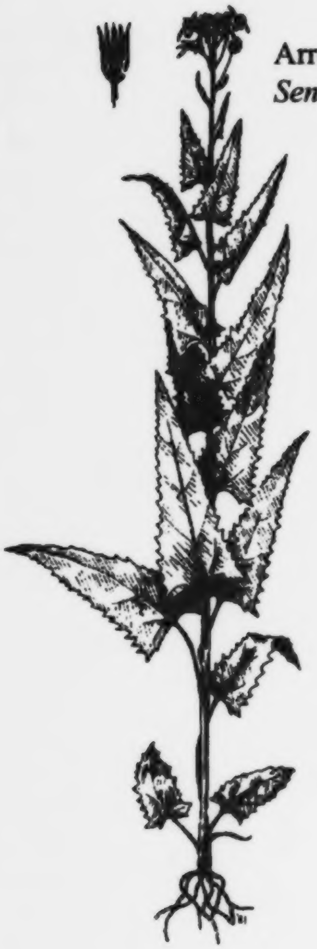
In the **SBSmc2**, zonal sites have:
- little or no white-flowered rhododendron or Sitka valerian.

Site Units of the ESSFmv1

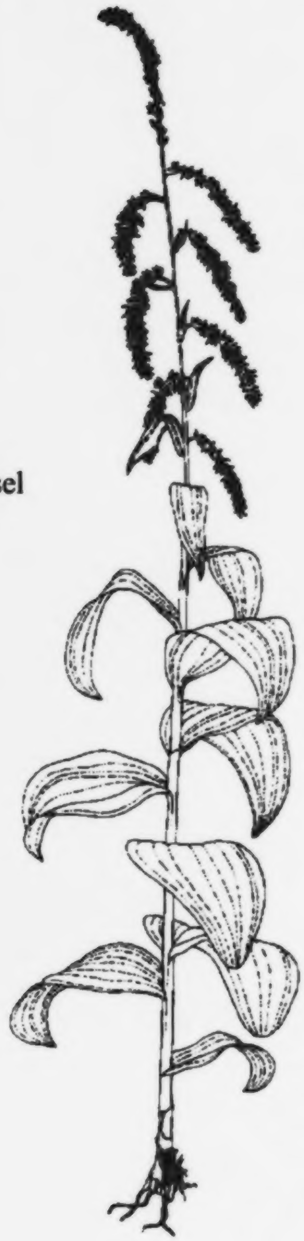
Site units of the ESSFmv1 have been described for the Prince George Forest Region by DeLong *et al.* (1993) ("A Field Guide for Site Identification and Interpretation for the Southwest Portion of the Prince George Forest Region") and generally apply to the ESSFmv1 in the Cariboo Forest Region. The reader should refer to this guide for a description of site units of the ESSFmv1 in the Cariboo Forest Region.



Five-leaved bramble
Rubus pedatus



Arrow-leaved groundsel
Senecio triangularis



Indian hellebore
Veratrum viride

ESSFwc3
ENGELMANN SPRUCE–SUBALPINE FIR WET COLD SUBZONE CARIBOO VARIANT

The ESSFwc3 includes the highest-elevation forests (generally above 1500 m) of the Quesnel Highland and Cariboo Mountains in the northeastern portion of the Cariboo Forest Region. It always occurs at elevations above the ESSFwk1 Variant and below the Alpine Tundra Zone. Elevations are typically 1500–1800 m. The ESSFwc3 receives, on average, more precipitation than any other forested subzone in the Cariboo Forest Region.

Distinguishing Adjacent Units from the ESSFwc3

The ESSFwc3 borders two other biogeoclimatic units: the **AT** (and associated parkland forest) at higher elevations and the **ESSFwk1** at lower elevations.

In the **ESSFwk1**, zonal sites have:
- common bunchberry and feathermosses;
- relatively closed forest canopy;
- less abundant white-flowered rhododendron;
- less subalpine fir in the upper forest canopy;
- little or no bracted lousewort.

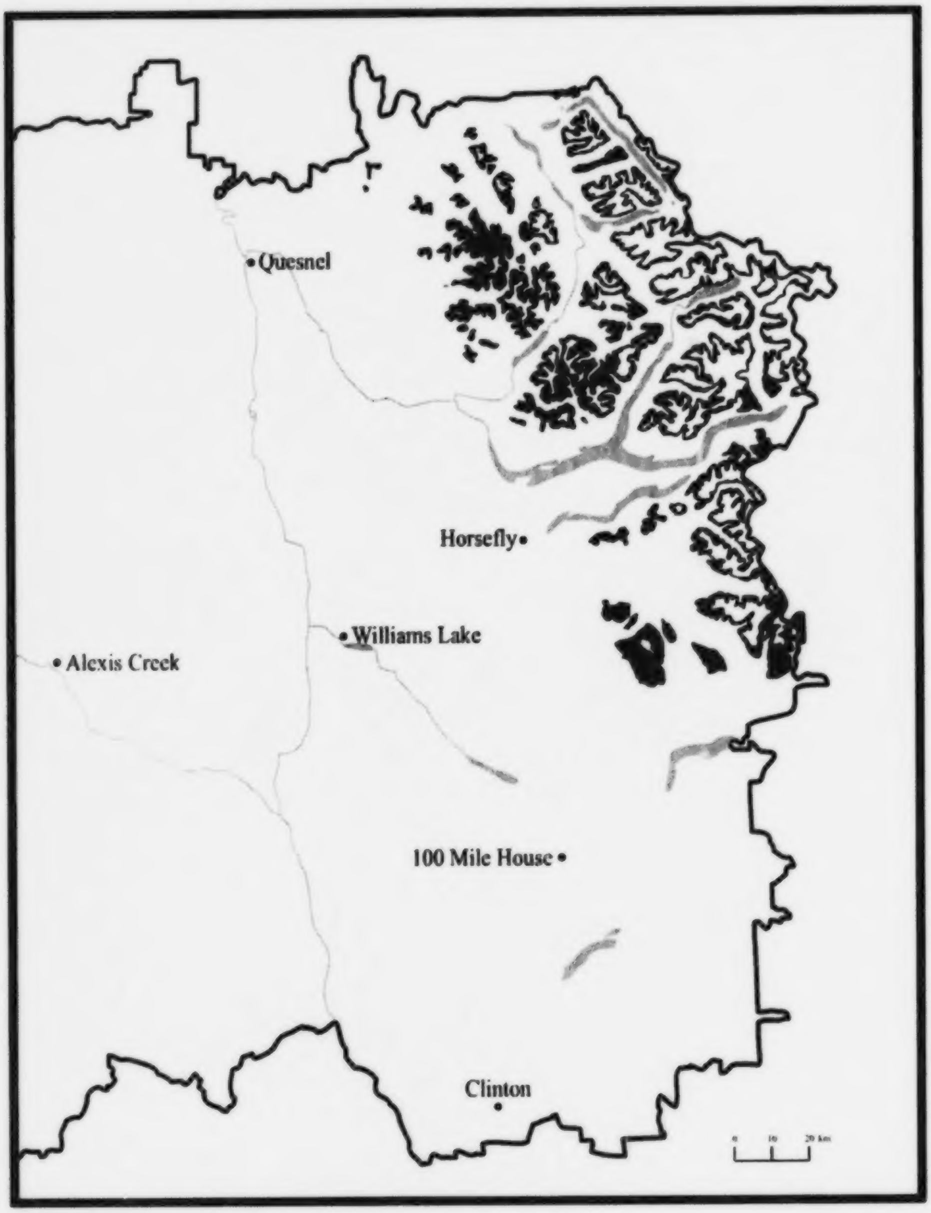
In the **AT** (and parkland) zonal sites have:
- predominantly non-forest (meadow, shrubland, etc.) vegetation;
- trees rarely more than 8 m tall.

Site Units of the ESSFwc3

Three ESSFwc3 forested site series have been described to date. It is anticipated that others are present and will be described in subsequent updates of this guide.

Zonal Site Series **01 Bl - Rhododendron - Oak fern Site Series** dominates the ESSFwc3 landscape and includes most gentle to moderately steep, middle and upper slope positions. Soils are developed primarily on loamy morainal or colluvial deposits. Subalpine fir and Engelmann spruce are the only common tree species.

Distribution of ESSFwc3 Variant in the Cariboo Forest Region


Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0
10
20 km

Subalpine fir most often dominates the forest canopy but large Engelmann spruce trees are usually scattered throughout the stand. The regeneration layer consists primarily of subalpine fir, which often establishes by "layering." Relatively few spruce seedlings are present, mostly on raised mineral soil microsites. Tree distribution in mature stands tends to be clumped, with non-treed patches in areas of late-lying snow or cold, wet soils. The undergrowth vegetation of mature forests has dense white-flowered rhododendron and lesser amounts of black huckleberry and oval-leaved blueberry. Several forb species with a low to moderate cover are present, including rosy twistedstalk, five-leaved bramble, Sitka valerian, one-leaved foamflower, mountain arnica, Indian hellebore, and oak fern. Bryophyte cover is nearly continuous and dominated by liverworts, leafy mosses, and *Dicranum* moss species.

Drier Forested Sites Sites drier than those of the zonal site series are relatively uncommon, occurring on ridge tops and upper slopes with shallow or coarse gravelly soils. These sites are distinguished by having a relatively small cover of herbaceous plants but abundant lichens.

02 Bl - Rhododendron - Queen's cup Site Series occurs on ridge tops and steep upper slopes on shallow soils, often with a high coarse fragment content. These are mostly small, localized sites. The mature forest canopy is typically dominated by subalpine fir but includes several scattered Engelmann spruce. Lodgepole pine occurs in some young stands. The undergrowth is characterized by a dense cover of white-flowered rhododendron and a sparse cover of low forbs. *Dicranum* mosses and lichens dominate the bryophyte/lichen layer.

Wetter Forested Sites Sites wetter than those of the zonal site series are common in the ESSFwc3, occurring on lower, toe, and depression slope positions. Compared to the zonal site series they have considerably more arrow-leaved groundsel, globeflower, and leatherleaf saxifrage, and less white-flowered rhododendron, heart-leaved twayblade, and stiff clubmoss.

03 Bl - Globeflower - Horsetail Site Series occurs on soils wetted by surface seepage water throughout most of the growing season. These occur primarily on middle and lower slope positions but also on upper slopes, where they are below late-lying snowbanks. Soils often have an Ah horizon. The mature forest canopy is very patchy, including small clumps of several trees surrounded by treeless patches where soils are wet and cold or snow lies late. The forest canopy is dominated by subalpine fir and large, more widely spaced Engelmann spruce. Tree regeneration is predominantly subalpine fir and most frequently established on raised microsites. The undergrowth is characterized by a poorly developed shrub layer and a high percent cover of herbaceous plants, including several characteristically wet-site subalpine meadow species such as arrow-leaved groundsel and globeflower. The moss layer is dominated by liverworts, leafy mosses, and *Brachythecium* species. The absence or low cover of white-flowered rhododendron distinguishes these sites from those of the /01 site series.

Non-forested Sites Wetlands are common on level to gently sloping sites along drainage channels and in seepage areas fed by prolonged snowmelt. Fens are the most common wetland type. Sedges, rushes, cottongrass, and several wetland forbs dominate these sites. Moist north aspects in the ESSFwc3 frequently have dense shrub communities dominated by Sitka alder. Avalanche tracks are common in the steeper terrain of this variant. These slopes are frequently dominated by Sitka alder as well as several species of tall forbs and grasses.

Key to Site Units of the ESSFwc3

1a. Soils thin (mostly <35 cm); bedrock outcrops usually present; moisture regime xeric or subxeric; crest or upper slope positions; ground lichens abundant; total herb cover relatively sparse (<20%cover)

ESSFwc3/02 Bl - Rhododendron - Queen's cup

1b. Soils deeper (>35 cm); bedrock outcrops generally absent; moisture regime submesic to subhygric; upper to lower and toe slope positions; ground lichens not abundant; total herb cover generally >20%.

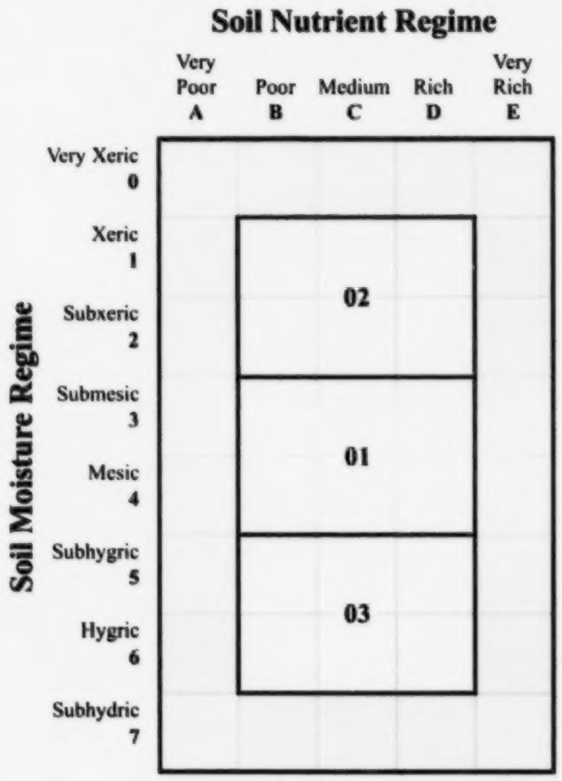
2a. Moisture regime submesic or mesic; no significant seepage inputs; white-flowered rhododendron cover greater than 20%; arrow-leaved groundsel and globeflower absent or incidental.

ESSFwc3/01 Bl - Rhododendron - Oak fern

2b. Moisture regime subhygric or hygric; temporary to permanent seepage present; white-flowered rhododendron cover sparse (<10%); arrow-leaved groundsel and globeflower present.

ESSFwc3/03 Bl - Globeflower - Horsetail

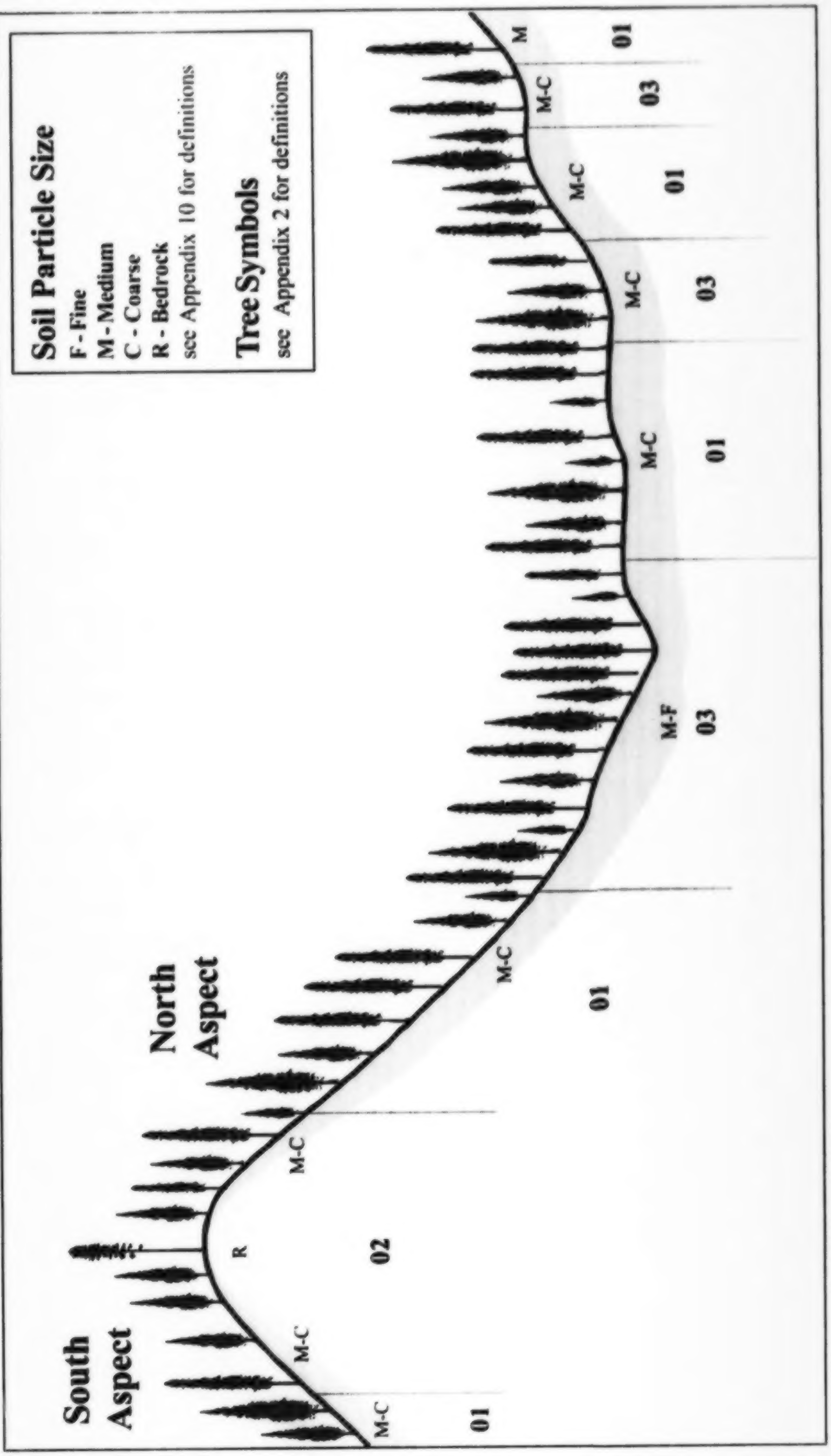
ESSFwc3 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
01
03

Site Series

01	Bl - Rhododendron - Oak fern
02	Bl - Rhododendron - Queen's cup
03	Bl - Globeflower - Horsetail

ESSFwc3 Landscape Profile


South Aspect
North Aspect
M-C
01
M-C
R
02
M-C
M-C
01
M-F
03
M-C
01
M-C
03
M-C
01
M-C
03
M
01
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions

Site Features of ESSFwc3 Site Series

Site Series	01	02	03
Key Features	zonal and other gentle to steeply sloping sites with submesic or mesic moisture regime	crest and upper slope positions with thin (<35 cm) soils overlying bedrock; rock outcrops usually present	mid and lower slope positions with intermittent or permanent near-surface seepage
Soil Moisture / Nutrient Regimes	submesic, mesic / poor - rich	xeric, subxeric / poor - rich	subhygric, hygric / poor - rich
Slope Position	mid, upper, gentle crests	crest, upper	mid, lower, toe, depression
Aspect	all	all, but predominantly south and west	all
Slope Grade (%)	0 - 45 (60)	0 - 45 (60)	0 - 45 (60)
Soil Texture	gravelly loamy	gravelly and rubbly coarse loamy	gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 2 - 8	Xeromor, Hemimor 1 - 4	Mormoder, Hydromoder, Humimor 3 - 20
Occurrence / Size / Distribution	very common / moderate / wide	common / small / wide	common / moderate / wide

ESSFwc3 Vegetation Table[a]

	Site Unit	02	01	03	
Tree Layer	*Pinus contorta*	▮			lodgepole pine
	Abies lasiocarpa	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	subalpine fir
	Picea engelmannii	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	Engelmann spruce
Shrub Layer	*Sorbus sitchensis*	▮▮	▮		Sitka mountain-ash
	Rhododendron albiflorum	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	white-flowered rhododendron
	Vaccinium membranaceum	▮▮▮▮	▮▮▮▮	▮▮▮	black huckleberry
	Ribes lacustre		▮▮▮	▮▮▮	black gooseberry
Herb Layer	*Arnica latifolia*	▮▮▮	▮		mountain arnica
	Clintonia uniflora	▮▮▮	▮		queen's cup
	Lycopodium annotinum	▮▮	▮▮		stiff clubmoss
	Rubus pedatus	▮▮▮	▮▮▮		five-leaved bramble
	Dryopteris expansa		▮▮		spiny wood fern
	Listera cordata		▮▮		heart-leaved twayblade
	Gymnocarpium dryopteris		▮▮▮	▮	oak fern
	Streptopus roseus	▮▮	▮▮▮	▮▮▮▮	rosy twistedstalk
	Veratrum viride	▮	▮▮▮	▮▮▮	Indian hellebore
	Tiarella trifoliata		▮▮▮	▮▮▮	foamflower
	Valeriana sitchensis	▮	▮▮▮▮	▮▮▮▮	Sitka valerian
	Vahlodea atropurpurea		▮	▮▮	mountain hairgrass
	Tiarella trifoliata		▮	▮▮	three-leaved foamflower
	Mitella breweri		▮	▮▮▮	Brewer's mitrewort
	Viola glabella		▮	▮▮▮	stream violet
	Parnassia fimbriata			▮	fringed grass-of-Parnassus
	Pedicularis bracteosa			▮▮	bracted lousewort
	Arnica cordifolia			▮▮▮	heart-leaved arnica
	Heracleum lanatum			▮▮▮	cow-parsnip
	Thalictrum occidentale			▮▮▮	western meadowrue
	Trollius laxus			▮▮▮	globeflower
	Senecio triangularis			▮▮▮▮	arrow-leaved groundsel
Moss Layer	*Peltigera aphthosa*	▮▮			freckle pelt
	Cladonia spp.	▮▮▮	▮		cladonia lichens
	Pleurozium schreberi	▮▮▮▮	▮▮▮		red-stemmed feathermoss
	Barbilophozia lycopodioides	▮▮▮	▮▮▮	▮	common leafy liverwort
	Dicranum spp.	▮▮▮▮▮	▮▮▮	▮▮▮	heron's-bill mosses
	Rhizomnium nudum		▮▮▮		leafy moss
	Rhytidiopsis robusta		▮▮▮		pipecleaner moss
	Brachythecium spp.		▮▮▮▮	▮▮▮▮▮	ragged mosses
	Marchantia polymorpha			▮	green-tongue liverwort

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

ESSFwk1
ENGELMANN SPRUCE–SUBALPINE FIR WET COOL SUBZONE CARIBOO VARIANT

The ESSFwk1 is extensive at moderate to high elevations of the Quesnel Highland and Cariboo Mountains along the eastern edge of the Cariboo Forest Region. It also occurs in the Prince George Forest Region. Elevations are predominantly 1200–1500 m.

Distinguishing Adjacent Units from the ESSFwk1

The **SBSwk1** occurs below the ESSFwk1 north of the Cariboo River. To the south, elevations below the ESSFwk1 are occupied by subzones of the ICH zone. The **ICHwk2** and **ICHwk4** occur below the ESSFwk1 in wet mountain valleys of the Quesnel Lake and Cariboo River areas while the **ICHmk3** occurs in the drier, more gentle terrain in the transition between the Fraser Plateau and the Quesnel Highland. The **ICHdk** borders the ESSFwk1 in the driest portion of its range, on the plateau just north of Canim Lake. The **ESSFwc3** occurs above the ESSFwk1 throughout its distribution in the Cariboo Forest Region.

In the **SBSwk1**, zonal sites have:
- saskatoon;
- little or no white-flowered rhododendron or Sitka valerian.

dry sandy (fluvial) soils have:
- abundant velvet-leaved blueberry.

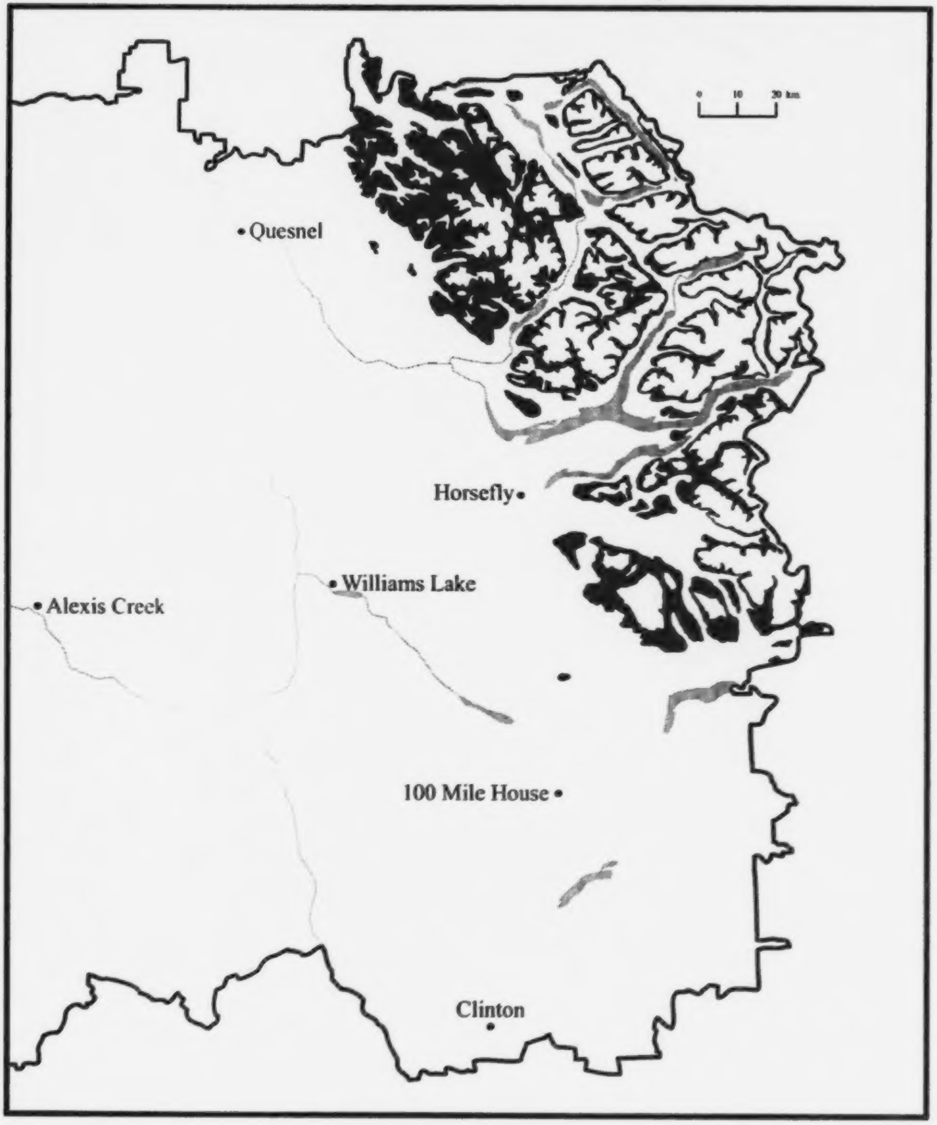
In the **ICHwk2**, zonal sites have:
- redcedar, western hemlock, Douglas-fir, and paper birch;
- occasional western yew;
- common falsebox;
- little or no white-flowered rhododendron or Sitka valerian.

wet sites have:
- common skunk cabbage.

In the **ICHwk4**, zonal sites have:
- redcedar, western hemlock, Douglas-fir, and paper birch;
- common falsebox;
- little or no white-flowered rhododendron or Sitka valerian.

dry sandy (fluvial) soils have:
- common velvet-leaved blueberry.

Distribution of ESSFwk1 Variant in the Cariboo Forest Region


0 10 20 km
Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton

In the **ICHmk3**, zonal sites have:
- redcedar, Douglas-fir, and paper birch;
- falsebox, wild sarsaparilla, and tall Oregon-grape;
- little or no white-flowered rhododendron or Sitka valerian.

In the **ICHdk**, zonal sites have:
- redcedar, Douglas-fir, paper birch, and trembling aspen;
- common falsebox, saskatoon, soopolallie, and wild sarsaparilla;
- common lodgepole pine;
- little or no white-flowered rhododendron or Sitka valerian.

In the **ESSFwc3**, zonal sites have:
- a relatively open forest canopy with clumped tree distribution;
- subalpine fir commonly dominant in forest canopy;
- uncommon bunchberry and devil's club;
- a relatively discontinuous cover of feathermosses.

Site Units of the ESSFwk1

Zonal Site Series **01 Bl - Oak fern - Brachythecium Site Series** dominates the ESSFwk1 landscape on gentle to moderate gradient slopes with deep soils. The mature forest canopy consists almost entirely of subalpine fir and Engelmann spruce. Lodgepole pine stems and small stands (seral) are very infrequent. Near the ICH Zone boundary, redcedar is frequently present. The climax forest consists mostly of multi-aged stands in which subalpine fir dominates the lower canopy layers while large Engelmann spruce trees dominate the upper canopy. Subalpine fir stems greatly outnumber spruce stems in regeneration layers. Standing dead trees are abundant and are mostly medium-sized subalpine fir and occasionally large spruce. Undergrowth vegetation is dominated by ericaceous shrubs, including white-flowered rhododendron and black huckleberry, a dense cover of moderately low-growing forbs, and a nearly continuous cover of mosses. The mosses are predominantly red-stemmed feathermoss and knight's plume.

Drier Sites Sites drier than the zonal site series are moderately common in the ESSFwk1 on rock outcrops, steep well-drained slopes, and terraces with gravelly sand soils. Lodgepole pine forests are more common on these than on zonal sites, and forbs are less abundant and considerably less productive. White-flowered rhododendron and black huckleberry are often the dominant undergrowth cover.

02 Bl - Huckleberry - Feathermoss Site Series occurs on hill crests and steep upper slopes where soils are thin and bedrock outcrops are present. It is uncommon and sites are usually very small. Forest canopies are relatively open and typically dominated by even-aged lodgepole pine. Tree regeneration is predominantly subalpine fir and Engelmann spruce with low vigour. The shrub layer has a sparse to moderate cover dominated by black huckleberry, saskatoon, and common juniper. The last two species distinguish these sites from other forested sites of the ESSFwk1. Herb cover is sparse, and ground lichens are more common than on other ESSFwk1 sites.

03 Bl - Oak fern - Knight's plume Site Series occurs on a variety of submesic and drier sites including steep slopes with shallow or sandy soils, slope crests and ridge tops with deep soils, and mid to upper slopes and level sites with gravelly sand soils. It is relatively common and often of moderate size. The mature forest canopy consists of various mixtures of subalpine fir, Engelmann spruce and lodgepole pine. Tree regeneration is predominantly Engelmann spruce and subalpine fir. Dense white-flowered rhododendron approximately 1.5 m tall dominates the undergrowth and distinguishes these sites from those of the zonal site series. The herb layer includes the same species found on the zonal site series although most species are less abundant. Moss cover is similar to that in the /01 site series in both percent cover and composition.

Wetter Sites Forested sites wetter than those of the zonal site series occur at the base of slopes and on cool aspects where a prolonged snow-melt augments seasonal precipitation. They also occur on moist riparian areas along stream courses and around the perimeter of lakes and wetlands. Sites are usually small but are often abundant and cover a large combined area. Engelmann spruce most often dominates the forest canopy.

04 Bl - Twinberry - Lady fern Site Series occurs on lower and toe slope positions, often adjacent to stream courses and wetlands. Soils are wetted by persistent seepage. At lower elevations of the ESSFwk1, these sites are often in cold air accumulation areas, but at higher elevations they occur on slopes where little cold air collects. The mature forest canopy is dominated by large, moderately spaced Engelmann spruce. Fewer subalpine fir are present. The undergrowth vegetation has dense shrubs and herbs and is dominated by black twinberry, thimbleberry, tall leafy forbs, ferns, and mosses. These sites are distinguished from those of the zonal site series by abundant black twinberry and thimbleberry and those of the /05 site series by absence or low cover of devil's club.

05 Bl - Devil's club - Lady fern Site Series occurs on mid to lower slopes where soils are wetted by persistent seepage water. In contrast to the /04 site series, it does not occur in cold air accumulation areas or at higher elevations of the ESSFwk1. It is most common on north- and east-facing slopes. The mature forest canopy is dominated by Engelmann spruce and subalpine fir but occasionally includes black cottonwood and western redcedar. A nearly continuous shrub layer is dominated by devil's club. Thimbleberry and black gooseberry are common, and ferns typically dominate the vigorous herb layer. Leafy mosses are abundant. This site series is distinguished by abundant devil's club and ferns and the lack of soft-leaved sedge, arrow-leaved groundsel, and horsetails.

06 Bl - Horsetail - Sphagnum Site Series occurs in small wet depressions where cold air accumulates. The mature forest canopy is dominated by widely spaced spruce and subalpine fir. Tree regeneration occurs primarily on raised microsites and is usually sparse. Few shrubs are present. The herb layer has a moderate cover of common horsetail and soft-leaved sedge as well as other species typical of high-elevation, cold wet sites (such as leatherleaf saxifrage and Sitka burnet). In contrast to the /07 site series, the moss layer includes abundant sphagnum mosses and glow moss.

07 Bl - Lady fern - Horsetail Site Series occurs in wet depressions with a near-surface water table. They are generally small and are more common than the /06 site series. The forest canopy is typically open and dominated by widely spaced spruce and subalpine fir. Regeneration is primarily restricted to raised microsites. The undergrowth typically has a moderate cover of shrubs and a wide variety of forbs including horsetails and cow parsnip.

Non-forested Sites Sitka alder communities are very common on north- and east-facing seepage areas. Shrub and herb wetlands are common and are most often fens. Bogs are uncommon. Tall herb–dominated avalanche tracks are common on steep slopes in high-relief terrain.

Key to Site Units of the ESSFwk1

1a. Soils shallow, mostly <50 cm to bedrock; moisture regime xeric, subxeric, or submesic.

  2a. Moisture regime xeric or subxeric; mostly crest or steep upper slope positions; dense rhododendron-dominated shrub layer not present; moss/lichen layer dominated by lichens.
  ESSFwk1/02 Bl - Huckleberry - Feathermoss

  2b. Moisture regime submesic; mostly upper to mid-slope positions; dense shrub layer includes >30% cover of white-flowered rhododendron; moss/lichen layer dominated by mosses.
  ESSFwk1/03 Bl - Oak fern - Knight's plume

1b. Soils deeper, mostly >50 cm to bedrock; moisture regime submesic to subhydric.

  3a. Moisture regime submesic or mesic; soils not wetted by seepage in mid summer and no distinct soil mottling or gleying present; queen's cup usually present and clasping twistedstalk and sedges usually absent.

    4a. Moisture regime submesic; dense shrub layer present with >30% cover of white-flowered rhododendron; total herb cover <40%.
    ESSFwk1/03 Bl - Oak fern - Knight's plume

    4b. Moisture regime generally mesic; shrub cover sparse to moderate, rhododendron cover <30%; herbaceous layer total cover >40% and dominated by oak fern.
    ESSFwk1/01 Bl - Oak fern - Brachythecium

  3b. Moisture regime subhygric to subhydric, soils wetted by intermittent to persistent seepage water or water table in mid-summer and distinct soil mottles or gleying usually present; queen's cup usually absent, and clasping twistedstalk or sedges usually present.

    5a. Moisture regime subhygric; no persistent water table within 60 cm of surface (temporary perched water table may be present early in growing season); sedges absent or incidental.

      6a. Devil's club abundant (>10% cover); black twinberry cover <2%; horsetail species absent or incidental.

ESSFwk1/05 Bl - Devil's club - Lady fern

6b. Devil's club not abundant (<10% cover); black twinberry cover >2%; horsetail species usually present with low cover.

ESSFwk1/04 Bl - Twinberry - Lady fern

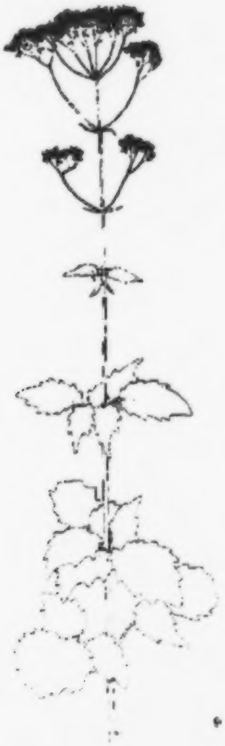
5b. Moisture regime hygric or subhydric; persistent water table within 60 cm of soil surface; sedges usually present.

7a. Sphagnum moss abundant (>15% cover); step moss, glow moss, and pink wintergreen present; lady fern and western meadowrue absent.

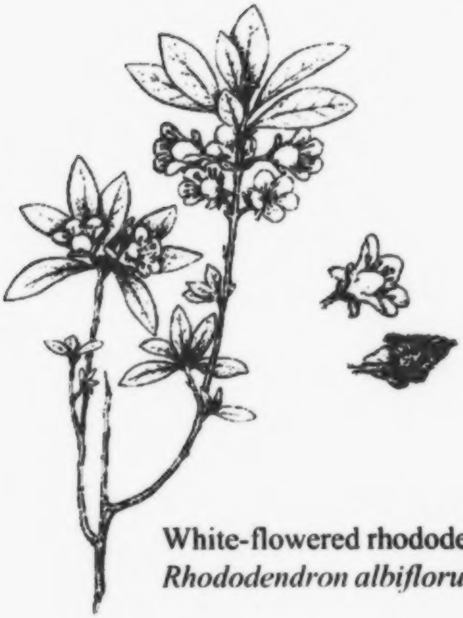
ESSFwk1/06 Bl - Horsetail - Sphagnum

7b. Sphagnum moss, step moss, glow moss, and pink wintergreen absent or incidental; lady fern and western meadowrue present.

ESSFwk1/07 Bl - Lady fern - Horsetail

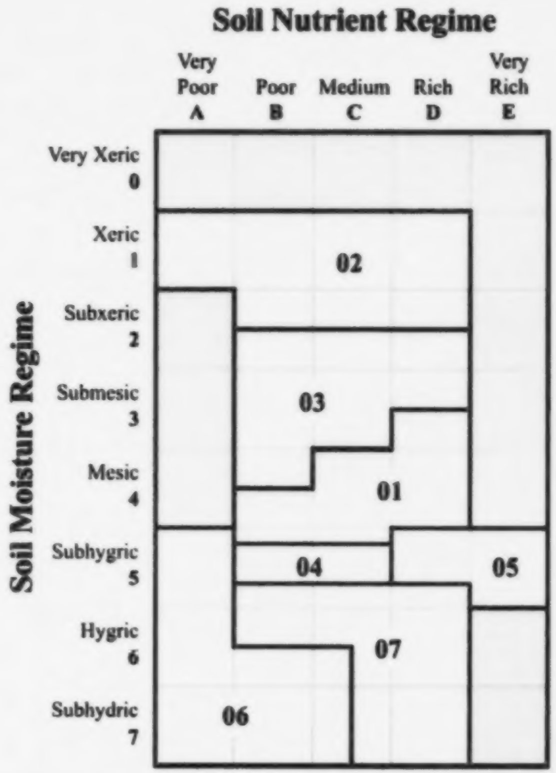


Sitka valerian
Valeriana sitchensis



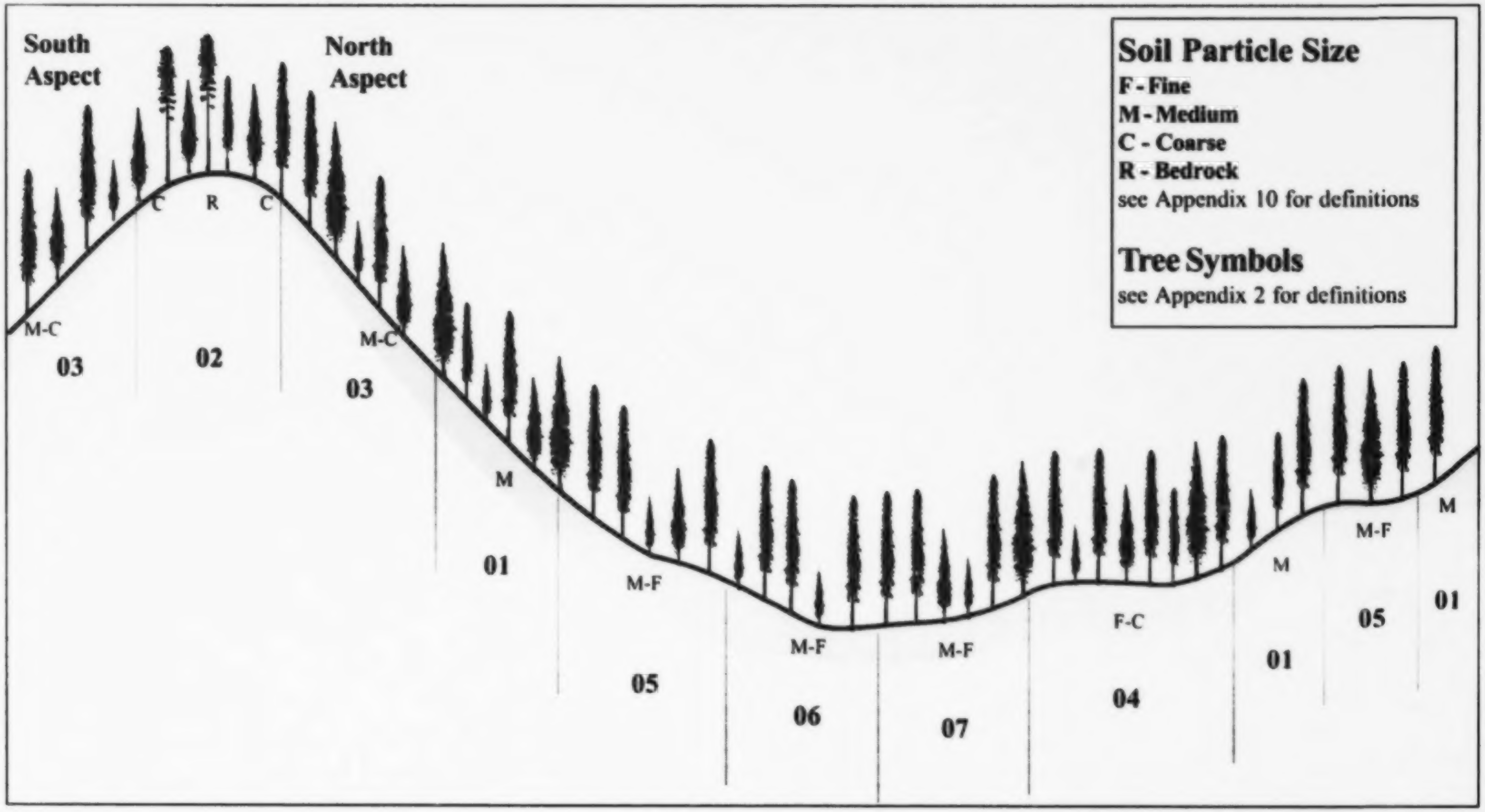
White-flowered rhododendron
Rhododendron albiflorum

ESSFwk1 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
01
04
05
07
06

Site	Series
01	Bl - Oak fern - Brachythecium
02	Bl - Huckleberry - Feathermoss
03	Bl - Oak fern - Knight's plume
04	Bl - Twinberry - Lady fern
05	Bl - Devil's club - Lady fern
06	Bl - Horsetail - Sphagnum
07	Bl - Lady fern - Horsetail

ESSFwk1 Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M-C
03
C
R
C
02
M-C
03
M
01
M-F
05
M-F
06
M-F
07
F-C
04
M
01
M-F
05
M
01

Site Features of ESSFwk1 Site Series

Site Series	01	02	03	04
Key Features	zonal and other gentle to moderately sloping sites with mesic or near-mesic moisture regime	hill crests, ridge tops and steep upper slopes with thin (< 50 cm) soils overlying bedrock	wide range of dry (mostly submesic) sites: broad crests, steep slopes and coarse, well-drained soils	moist lower and toe slope positions, often adjacent to streams and wetlands
Soil Moisture / Nutrient Regime	submesic subhygric / poor - rich	xeric, subxeric / very poor - rich	subxeric, submesic (mesic) / poor - rich	subhygric / poor - medium
Slope Position	mid (upper - lower)	crest, upper	crest - mid	mid, lower, toe
Aspect	all	all, but mostly SE, S, SW, W	all	all
Slope Grade%	5 - 30 (60)	0 - 60	0 - 60	0 - 45
Soil Texture	gravelly loamy	gravelly sandy and loamy	gravelly loamy	gravelly loamy and fine loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 3 - 10	Xeromor, Hemimor, Hemihumimor 2 - 6	Hemimor, Hemihumimor 2 - 5	Hemihumimor, Hemimor, Humimor 15 - 30
Occurrence / Size / Distribution	predominant / moderate / wide	uncommon / small / wide	common / moderate / wide	common / small / wide

Site Features of ESSFwk1 Site Series (continued)

Site Series	05	06	07
Key Features	mid and lower slopes with soils moistened by seepage water during most of the growing season	wet lower and toe slopes and depressions with near-surface (< 60 cm) water table and sphagnum peat	similar to /06 but without sphagnum peat; very wet sites with near-surface (< 60 cm) water table
Soil Moisture / Nutrient Regime	subhygric / rich, very rich	subhygric - subhydric / very poor - medium	subhygric - subhydric / poor - rich
Slope Position	mid, lower	lower, toe, depression	toe, depression
Aspect	all, most mostly NW, N, NE, E	all	none
Slope Grade%	15 - 55	0 - 20 (35)	< 5
Soil Texture	gravelly loamy	variable	fine loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor. Hydromor 3 - 25	Hydromor, Hydromull 15 - 40	Hydromoder, Histomoder, Hydromor 10 - 20
Occurrence / Size / Distribution	common / moderate / wide	uncommon / small / wide	common / small / wide

ESSFwk1 Vegetation Table[a]

	Site Unit	02	03	01	04	05	06	07	
Tree Layer	*Pinus contorta*	▮▮▮▮							lodgepole pine
	Picea engelmannii	▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	Engelmann spruce
	Abies lasiocarpa	▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	subalpine fir
Shrub Layer	*Amelanchier alnifolia*	▮▮							saskatoon
	Rhododendron albiflorum	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮	▮		white-flowered rhododendron
	Vaccinium membranaceum	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	black huckleberry
	Vaccinium ovalifolium		▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮	oval-leaved blueberry
	Ribes lacustre		▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	black gooseberry
	Oplopanax horridus					▮▮▮▮▮			devil's club
	Lonicera involucrata			▮	▮▮▮▮	▮	▮▮▮	▮▮▮	black twinberry
	Rubus parviflorus		▮	▮	▮	▮▮▮▮	▮	▮▮▮	thimbleberry
Herb Layer	*Hieracium albiflorum*	▮							white-flowered hawkweed
	Clintonia uniflora	▮	▮▮	▮▮▮		▮			queen's cup
	Cornus canadensis	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	bunchberry
	Rubus pedatus	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	five-leaved bramble
	Streptopus roseus		▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	rosy twistedstalk
	Gymnocarpium dryopteris		▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮	▮▮▮▮	oak fern
	Tiarella trifoliata var. *trifoliata*		▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	three-leaved foamflower
	Valeriana sitchensis		▮	▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮	Sitka valerian
	Listera cordata		▮	▮▮	▮	▮	▮	▮▮▮	heart-leaved twayblade
	Dryopteris expansa		▮	▮	▮▮▮	▮▮▮	▮	▮▮▮	spiny wood fern
	Athyrium filix-femina			▮	▮▮▮▮	▮▮▮▮		▮▮	lady fern
	Tiarella trifoliata var. *unifoliata*			▮	▮▮	▮▮▮	▮		one-leaved foamflower
	Galium triflorum				▮▮	▮▮	▮	▮▮	sweet-scented bedstraw
	Equisetum arvense				▮▮		▮▮▮	▮▮	common horsetail
	Senecio triangularis				▮		▮▮	▮	arrow-leaved groundsel
	Viola glabella				▮▮	▮▮▮	▮▮	▮▮▮▮	stream violet
	Heracleum lanatum				▮	▮	▮	▮▮▮	cow-parsnip
	Carex disperma						▮▮▮	▮▮	soft-leaved sedge
Moss Layer	*Cladonia* spp.	▮▮▮							cladonia lichens
	Dicranum spp.	▮▮▮▮▮	▮▮	▮▮▮	▮▮		▮	▮	heron's-bill mosses
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	red-stemmed feathermoss
	Peltigera aphthosa	▮▮	▮▮	▮	▮			▮	freckle pelt
	Ptilium crista-castrensis	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮	▮▮▮	knight's plume
	Barbilophozia lycopodioides	▮	▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮	▮	common leafy liverwort
	Brachythecium spp.		▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮	▮▮▮	ragged mosses
	Hylocomium splendens		▮	▮	▮▮▮		▮▮▮▮▮		step moss
	Aulacomnium palustre						▮▮▮▮		glow moss
	Sphagnum spp.						▮▮▮▮▮		sphagnums
	Rhizomnium punctatum				▮		▮▮▮▮	▮▮▮▮	leafy moss

---

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

ESSFxc
ENGELMANN SPRUCE–SUBALPINE FIR
VERY DRY COLD SUBZONE

The ESSFxc has a very small area (115 km^2) in the Cariboo Forest Region, occurring on upper slopes and summits of the Marble Range. Elevations are generally 1550–2000 m. The ESSFxc is more extensive in the Kamloops Forest Region on the Graystokes Plateau. Okanagan Ranges, and some high elevations northwest of Kamloops. It also occurs in the Camelsfoot, Chilcotin, and Lillooet ranges.

Distinguishing Adjacent Units from the ESSFxc (Cariboo Forest Region only)

The **MSxk** occurs below the ESSFxc, and the **AT,** including parkland, occurs above the ESSFxc.

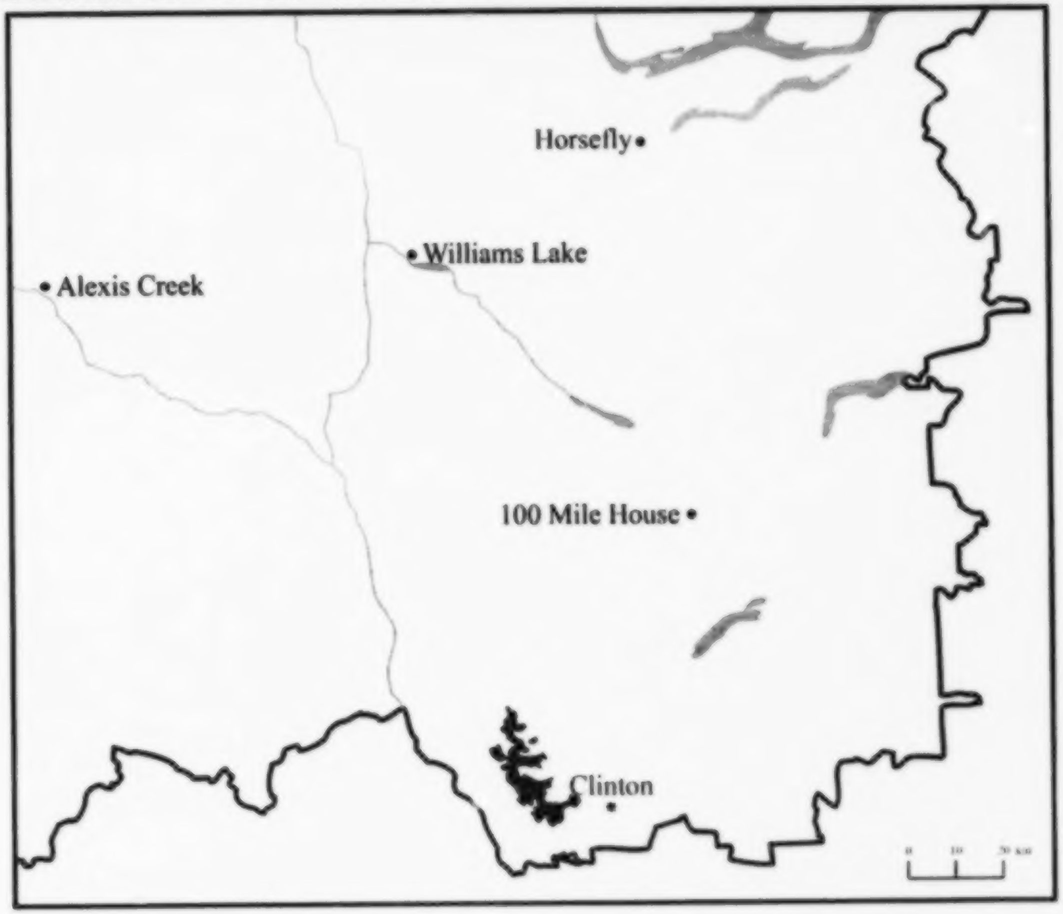
In the **MSxk**, zonal sites have:
- pinegrass;
- little or no Sitka valerian, mountain arnica, or five-leaved bramble;
- little or no white-flowered rhododendron.

In the **AT** (and parkland), zonal sites have:
- predominantly non-forest (meadow, shrubland, etc.) vegetation;
- trees rarely more than 8 m tall.

Site Units of the ESSFxc

A site classification for the Kamloops Forest Region portion of the ESSFxc is presented by Lloyd *et al.* (1990). Preliminary surveys indicate that this classification generally applies to the ESSFxc in the Cariboo Forest Region as well. It should also be noted that, due to calcareous soil parent materials, vegetation of the Marble Range in the Cariboo and Kamloops forest regions differs somewhat from vegetation in the remainder of the ESSFxc.

Distribution of ESSFxc Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0 10 20 km

ESSFxv1
ENGELMANN SPRUCE–SUBALPINE FIR
VERY DRY VERY COLD SUBZONE
WEST CHILCOTIN VARIANT

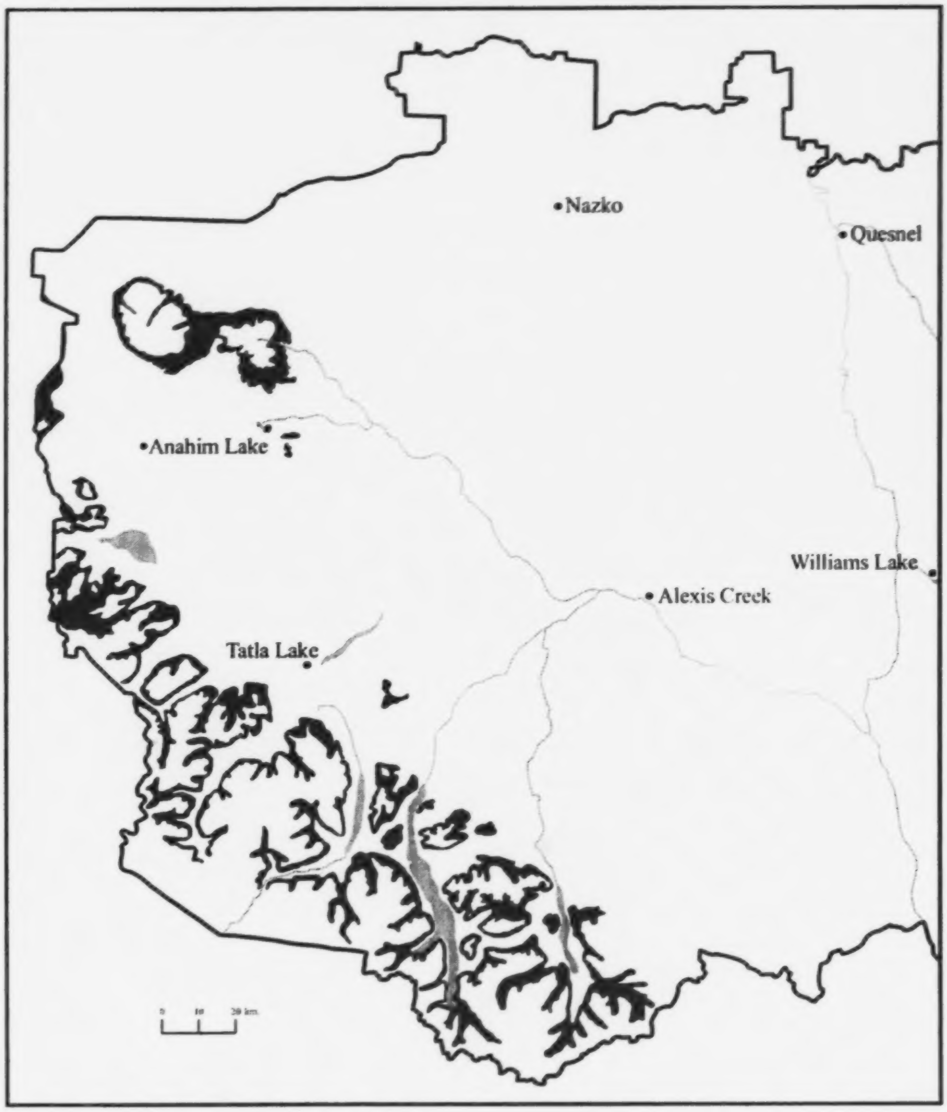
The ESSFxv1 includes the highest-elevation forests on the leeward slopes of the Coast Mountains west of Taseko Lakes. It extends from Anvil Mountain west to Tweedsmuir Park and also occurs in the Itcha and Ilgachuz mountains. The ESSFxv1 landscape ranges from low rounded summits with little dissected slopes along its eastern edge to high rugged mountains in central and western portions. Elevations are primarily 1650–2100 m.

The site series classification presented here applies primarily to the low and middle elevations of the ESSFxv1. Forests at the upper elevations of the ESSFxv1 have not been sufficiently well sampled to develop a site series classification. The upper-elevation forests typically have a very open tree canopy and contain many herb and dwarf shrub species typically found in alpine tundra vegetation. Openings in these highest-elevation forests often have vegetation similar to that of alpine tundra sites.

Distinguishing Adjacent Units from the ESSFxv1

The **ESSFxv2** occurs at similar elevations east of Anvil Mountain in the headwaters of Big and Churn creeks. The **MSxv** lies below the ESSFxv1 on the Fraser Plateau and slopes of the Coast Mountains that overlook the Fraser Plateau. The **MSdc2** and **MSdv** occur below the ESSFxv1 in the valleys of the Coast Mountains near Chilko and Taseko lakes. The **IDFdw** is mapped directly below the ESSFxv1 locally in valleys of the Coast Mountains where slopes are so steep that the transition from IDF to ESSF is very short. The **CWH** zone occurs below the ESSFxv1 locally at the southern end of Chilko Lake. The **MHmm2**, which has a coastal transition climate, occurs below the ESSFxv1 in the Homathko and Mosley river valleys near the Vancouver Forest Region boundary.

Distribution of ESSFxv1 Variant in the Cariboo Forest Region


Nazko
Quesnel
Anahim Lake
Williams Lake
Alexis Creek
Tatla Lake
0
10
20 km

The **AT** zone occurs above the ESSFxv1 and includes the parkland where clumps of short trees occur in a matrix of alpine tundra vegetation.

In the **ESSFxv2**, zonal sites have:
- little or no grouseberry;
- less abundant subalpine fir and soopolallie;
- more abundant arctic lupine, northwestern sedge, and wild strawberry.

In the **MSxv**, zonal sites have:
- common pinegrass and prickly rose;
- more abundant red-stemmed feathermoss and bunchberry;
- little or no subalpine fir, arctic lupine, mountain sagewort, whitebark pine, or white-flowered rhododendron.

wet sites have:
- little or no Sitka valerian, Indian hellebore, or pink mountain-heather.

In the **MSdc2 and MSdv**, zonal sites have:
- abundant red-stemmed feathermoss, knight's plume moss, and Sitka alder;
- common pinegrass, prickly rose, and step moss;
- little or no arctic lupine, mountain sagewort, or pink mountain-heather.

In the **IDFdw**, zonal sites have:
- common Douglas-fir and pinegrass.

In the **CWH**, zonal sites have:
- western redcedar, western hemlock, and feathermosses;
- little or no grouseberry or cladonia lichens.

In the **MHmm2**, zonal sites have:
- mountain hemlock, amabilis fir, pipecleaner moss, and red-stemmed feathermoss;
- little or no grouseberry or cladonia lichens.

In the **AT**, zonal sites have:
- non-forest vegetation (alpine tundra);
- trees, if present, seldom more than 8 m tall.

Site Units of the ESSFxv1

Zonal Site Series **01 Bl - Arnica - Cladonia Site Series** is the predominant site series of the ESSFxv1. It is most common on mid slope positions but also extends to upper and lower slope positions and level sites. Subalpine fir and Engelmann spruce are climax species but, due to past wildfires and slow rates of succession in this cold, dry climate, most natural mature stands are dominated by lodgepole pine. The undergrowth vegetation has a sparse shrub layer and a low to moderate cover of low forbs, principally heart-leaved arnica, grouseberry, and arctic lupine. Several other herbaceous species are present but have very low cover values. The moss/lichen layer is relatively sparse and primarily *Dicranum* mosses and cladonia lichens.

Drier Sites Sites drier than those of the zonal site series occur on hill crests, steep slopes, south and west aspects, and coarse soils. They are moderately common. Compared to zonal or other mesic sites they have a greater abundance and diversity of lichens, more abundant common juniper, and little or no Sitka valerian.

02 BlPa - Juniper - Cladonia Site Series occurs on ridge tops and other crest slope positions where bedrock is near (<50 cm) the surface. Soils typically contain high amounts of coarse fragments. The mature forest canopy is moderately open and most often dominated by lodgepole pine. Equal amounts of whitebark pine are sometimes present. Subalpine fir is common in the understory. The undergrowth vegetation is sparse and typically includes scattered common juniper, a few low herbs, and abundant lichens.

03 Pl - Cladonia - Stereocaulon Site Series has been recorded only in the Itcha Mountains but is probably more widely distributed. It occurs on coarse glaciofluvial soils, primarily on gentle outwash slopes and terraces. The mature forest canopy is typically very open and dominated by lodgepole pine. Shrubs and herbaceous species (primarily common juniper, grouseberry, and crowberry) are sparse but lichens are very abundant. Lichens, especially *Cladina, Cladonia,* and *Stereocaulon* species, typically cover more than 50% of the soil surface and distinguish these sites from those in other site series.

04 BlPa - Juniper - Grouseberry Site Series occurs on upper slope positions of steep south- and west-facing slopes. Soils usually have a very high coarse fragment content. The mature forest canopy on these dry ecosystems consists of relatively open-grown whitebark pine and lodgepole pine. Both pines as well as subalpine fir are common in the understory. The undergrowth vegetation has abundant common juniper and, occasionally, soopolallie. Herbaceous plants typically have a sparse cover consisting of a small number of species. Heart-leaved arnica and grouseberry are usually present.

05 BlPa - Arnica - Twinflower Site Series occurs on upper slope positions of moderate to steep north- and east-facing slopes. Soils are often gravelly and sometimes less than 50 cm deep over bedrock. In contrast to /02 sites, which also have near-surface bedrock, sites do not occur on crests or on upper slopes with a strongly convex surface shape. The mature forest canopy is typically dominated by a mixture of lodgepole pine, whitebark pine, and subalpine fir. Subalpine fir regeneration is often dense. Undergrowth vegetation has a sparse to moderate cover of low shrubs (common juniper, falsebox, and black huckleberry) and herbaceous species (especially heart-leaved arnica, twinflower, and grouseberry). The presence of twinflower and one-sided wintergreen together with the low percent (<5%) cover of white-flowered rhododendron distinguishes the vegetation of these sites.

06 Bl - Rhododendron - Crowberry Site Series occurs on mid and upper slope positions of gentle to steep, north- and east-facing slopes. It also occurs on lower slopes with coarse-textured soils where these soils are moistened by intermittent seepage. The mature forest canopy is dominated by lodgepole pine or subalpine fir. Whitebark pine and spruce are also usually present. The undergrowth vegetation is distinguished by abundant white-flowered rhododendron and occasionally black huckleberry. Grouseberry, crowberry, and heart-leaved arnica dominate the herb layer.

Wetter Sites Sites wetter than mesic are relatively common but generally small. They occur on lower and toe slope seepage areas and in local depressions. In addition to being moist or wet, they are typically sites of cold air accumulation. The undergrowth is distinguished from drier site series by the presence of palmate coltsfoot, Indian hellebore, Sitka valerian, black twinberry, or horsetail species.

07 Bl - Valerian - Arnica Site Series occurs on mid to toe slope positions of gentle to moderate gradient slopes where soils are moistened by intermittent to persistent seepage. Most sites are on north- or east-facing slopes. The mature forest canopy is often a mixture of Engelmann spruce or subalpine fir and lodgepole pine. Herbaceous species, ranging from low to medium height, are abundant and dominate the undergrowth. Principal species include Sitka valerian, heart-leaved arnica, one-sided wintergreen, arctic lupine, and Indian hellebore. Mosses are typically more abundant than on drier sites and are principally *Brachythecium* and *Dicranum* species.

08 Bl - Horsetail - Glow moss Site Series is common on toe slope positions and in small depressions where a water table is near the surface and soils are gleyed or strongly mottled. It occurs primarily in valley bottoms where cold air accumulates. The mature forest canopy is moderately open and dominated by lodgepole pine and Engelmann spruce. Low shrubs (especially Labrador tea, black twinberry, willows, and scrub birch) are moderately abundant. Crowberry and several low- to medium-height forbs dominate the relatively well-developed herb layer. The vegetation, which has similarities to bog wetlands, is distinguished by Labrador tea, western bog-laurel, and sphagnum moss.

09 Bl - Twinberry - Hellebore Site Series occurs on toe slope positions and in depressions with a near-surface water table or abundant near-surface seepage flow. In contrast to the /08 site series, sites occur primarily on valley side slopes, which are better drained of cold air than valley bottoms. The mature forest canopy is dominated by Engelmann spruce and subalpine fir and the undergrowth is distinguished by a vigorous herbaceous layer containing several species indicative of wet, rich sites. These include clasping twistedstalk, fringed grass-of-Parnassus, cow-parsnip, and abundant *Brachythecium* and leafy mosses. The vegetation has fewer similarities to bog wetlands than do /08 sites.

Non-forested Sites The natural landscape of the ESSFxv1 is mostly forested but several small wetlands occur in depressions and on seepage slopes and are primarily fens. Moist meadows occur in valley bottoms where cold air collects and are similar to alpine communities. Grasslands are very uncommon and primarily on steep south aspects.

Key to Site Units of the ESSFxv1

1a. Soils shallow (<50 cm), bedrock outcrops often present; slope position mostly crest; moisture regime very xeric to subxeric.

ESSFxv1/02 BlPa - Juniper - Cladonia

1b. Soils deeper (sometimes <50 cm in /05), bedrock outcrops usually absent; slope position not crest except on subdued hills; moisture regime subxeric or wetter.

- 2a. Slope gradient >30%.
  - 3a. Slope aspect SE, S, SW, or W; moisture regime subxeric or submesic; one-sided wintergreen and twinflower usually absent or incidental.
    ESSFxv1/04 BlPa - Juniper - Grouseberry
  - 3b. Slope aspect NW, N, NE, or E; moisture regime predominantly submesic or mesic; one-sided wintergreen or twinflower present.
    - 4a. White-flowered rhododendron cover >15%, crowberry usually present.
      ESSFxv1/06 Bl - Rhododendron - Crowberry
    - 4b. White-flowered rhododendron cover generally <2%; crowberry usually absent or incidental.
      ESSFxv1/05 BlPa - Arnica - Twinflower
- 2b. Slope gradient <30%
  - 5a. Moisture regime subxeric, submesic, or mesic; slope position mostly upper or mid; no evidence of persistent seepage or water table within 1 m of surface; Sitka valerian, Indian hellebore, pink wintergreen, globeflower, Labrador tea, sphagnum moss, and leafy mosses absent or incidental.
    - 6a. Soil texture sand or loamy sand, and gravel content high; moisture regime subxeric or submesic; cover of ground lichens >30%.
      ESSFxv1/03 Pl - Cladonia - Stereocaulon
    - 6b. Soil texture mostly sandy loam or finer but if sand then generally fine sands, and gravel content not high; moisture regime submesic or mesic.
      - 7a. White-flowered rhododendron cover >15%.
        ESSFxv1/06 Bl - Rhododendron - Crowberry

7b. White-flowered rhododendron <15% (mostly <2%) cover.
ESSFxv1/01 Bl - Arnica - Cladonia

5b. Moisture regime subhygric to subhydric; slope position lower, toe, or depression (occasionally mid in /07); evidence of seepage water or water table within 1 m of surface; Sitka valerian, Indian hellebore, pink wintergreen, globeflower, Labrador tea, sphagnum moss, or leafy mosses present.

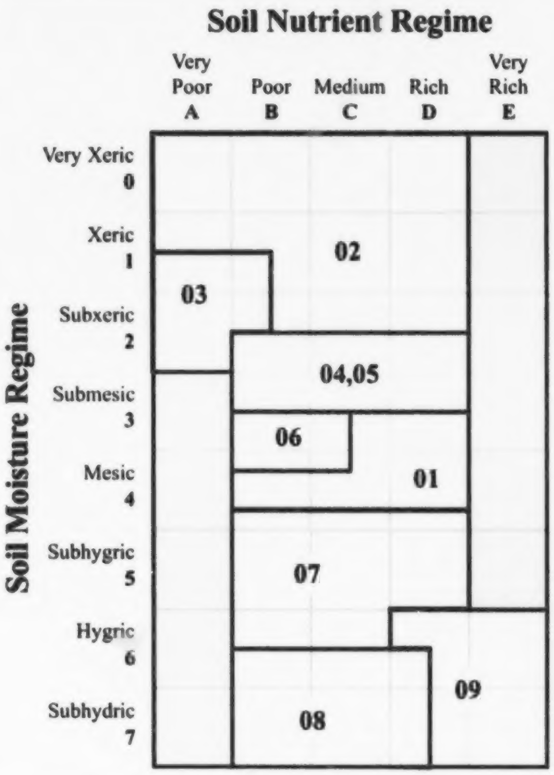
8a. Moisture regime subhygric; water table or free seepage water flow not present within 50 cm of surface; slope position lower or toe; pelt lichens and bracted lousewort usually present; globeflower, Labrador tea, sphagnum moss, scrub birch, and horsetails absent or incidental.
ESSFxv1/07 Bl - Valerian - Arnica

8b. Moisture regime hygric or subhydric; water table or free seepage water flow usually present within 50 cm of surface; slope position toe or depression; pelt lichens and bracted lousewort usually absent; globeflower, Labrador tea, sphagnum moss, scrub birch, or horsetail species present.

9a. Labrador tea, crowberry, and sphagnum moss present; bluejoint absent or incidental; sites mostly in valley bottoms where cold air accumulates.
ESSFxv1/08 Bl - Horsetail - Glow moss

9b. Labrador tea, crowberry, and sphagnum moss absent or incidental; bluejoint present; sites mostly on terraces and in concave areas on valley side slopes with better cold air drainage.
ESSFxv1/09 Bl - Twinberry - Hellebore

ESSFxv1 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04,05
06
01
07
09
08

Site	Series
01	**B1** - Arnica - Cladonia
02	**B1Pa** - Juniper - Cladonia
03	**P1** - Cladonia - Stereocaulon
04	**B1Pa** - Juniper - Grouseberry
05	**B1Pa** - Arnica - Twinflower
06	**B1** - Rhododendron - Crowberry
07	**B1** - Valerian - Arnica
08	**B1** - Horsetail - Glow moss
09	**B1** - Twinberry - Hellebore

Site Features of ESSFxv1 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	dry crests and some upper slopes with shallow soils (< 50 cm) over bedrock	level to gently sloping sites with dry, very gravelly sandy soils	upper slope positions on steep S and W aspects; soils usually have high coarse fragment content	upper slope positions on steep N and E aspects; soils usually have high coarse fragment content
Soil Moisture / Nutrient Regimes	mesic, submesic / poor - rich	very xeric - subxeric / very poor - rich	xeric, subxeric / very poor, poor	subxeric, submesic / poor - rich	submesic (subxeric) / poor - rich
Slope Position	mid (upper, lower, level)	crest (upper)	level	upper, mid	upper
Aspect	all	all	all	SE, S, SW, W	NW, N, NE, E
Slope Grade %	0 - 30	0 - 70	0 - 5	35 - 70	20 - 70
Soil Texture	loamy, sandy; often gravelly	loamy, sandy; usually gravelly or rubbly	gravelly sandy	gravelly and rubbly loamy (sandy)	gravelly and rubbly loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 10	Xeromor 1 - 3	Xeromoder 1 - 3	Xeromoder, Mormoder 1 - 10 (25)	Xeromoder, Mormoder 3 - 8
Occurrence / Size / Distribution	common / medium - large / wide	uncommon / small / wide	uncommon / medium / recorded only in Itcha Mt. area	common / medium / wide	common / medium / wide

Site Features of ESSFxv1 Site Series (continued)

Site Series	06	07	08	09
Key Features	mid to upper slopes of gentle to steep NW, N, NE, and E aspects; also on lower slopes with coarse soils	moist seepage sites on mid to lower slopes; mostly N aspects; intermittent or persistent seepage	toe slope positions and small depressions with near-surface (< 50 cm) water table; mostly valley bottoms	toe slope positions and small depressions with near-surface (< 50 cm) water table on valley slopes and hillsides; persistent seepage
Soil Moisture / Nutrient Regimes	submesic, mesic (subhygric) / poor, medium	subhygric (mesic - hygric) / poor - rich	hygric, subhydric / poor - rich	hygric, subhydric / rich - very rich
Slope Position	mid, upper	mid, lower	toe, depression	toe, depression
Aspect	NW, N, NE, E	NW, N, NE, E	all	N/A
Slope grade %	10 - 70	0 - 35	0 - 10	0 - 5
Soil Texture	gravelly loamy and sandy	loamy, often gravelly	loamy and silty	loamy, silty
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 1 - 10 (25)	Hemihumimor, Mormoder 7 - 20	Hemimor, Saprimull > 20	Histomoder > 10
Occurrence / Size / Distribution	common / medium - large / wide	common / small - medium / wide	common / small / wide	uncommon / small / wide

ESSFxv1 Vegetation Table[a]

	Site Unit	02	03	04	05	06	01	07	08	09	
Tree Layer	*Abies lasiocarpa*	▮▮		▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	▮	▮▮▮	subalpine fir
	Pinus albicaulis	▮▮▮▮		▮	▮▮▮▮	▮▮▮	▮	▮		▮▮▮	whitebark pine
	Pinus contorta	▮▮▮	▮▮▮▮▮	▮	▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	lodgepole pine
	Picea engelmannii						▮	▮▮▮▮	▮	▮	Engelmann spruce
Shrub Layer	*Vaccinium scoparium*	▮	▮▮▮	▮▮▮	▮	▮▮▮▮	▮▮▮	▮	▮▮▮▮	▮▮▮	grouseberry
	Rhododendron albiflorum				▮	▮▮▮▮▮		▮	▮	▮▮▮	white-flowered rhododendron
	Salix sp.								▮▮▮▮		willow
	Betula glandulosa								▮▮▮		scrub birch
	Lonicera involucrata							▮	▮▮▮	▮▮▮	black twinberry
	Paxistima myrsinites	▮								▮▮	falsebox
Herb Layer	*Artemisia norvegica*		▮▮		▮	▮▮▮	▮	▮			mountain sagewort
	Epilobium angustifolium		▮▮	▮	▮		▮	▮▮	▮	▮▮	fireweed
	Arnica cordifolia			▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮	▮▮	heart-leaved arnica
	Pedicularis bracteosa				▮			▮▮▮			bracted lousewort
	Linnaea borealis				▮▮▮		▮	▮	▮	▮▮▮	twinflower
	Achillea millefolium			▮			▮	▮			yarrow
	Thalictrum occidentale				▮			▮		▮▮▮	western meadowrue
	Cornus canadensis					▮		▮	▮▮▮	▮▮▮	bunchberry
	Empetrum nigrum		▮▮			▮▮▮▮	▮	▮	▮▮▮▮▮		crowberry
	Valeriana sitchensis					▮		▮▮▮▮	▮	▮▮▮▮	Sitka valerian
	Vaccinium caespitosum						▮		▮▮▮▮		dwarf blueberry
	Veratrum viride							▮▮▮		▮▮▮▮	Indian hellebore
	Sanguisorba canadensis								▮▮▮	▮▮▮▮	Sitka burnet
	Calamagrostis canadensis							▮		▮▮▮	bluejoint
	Trollius laxus									▮▮▮	globeflower
	Erigeron peregrinus							▮		▮▮▮	subalpine daisy
	Heracleum lanatum							▮		▮▮▮	cow-parsnip
	Parnassia fimbriata									▮▮▮	fringed grass-of-Parnassus
	Streptopus amplexifolius									▮▮▮	clasping twistedstalk
Moss Layer	*Cladina* spp.	▮	▮▮▮▮								reindeer lichens
	Polytrichum spp.		▮▮▮▮						▮		haircap mosses
	Stereocaulon spp.		▮▮▮▮								coral lichens
	Peltigera spp.	▮▮▮		▮	▮▮▮		▮	▮▮▮			pelt lichens
	Cladonia spp.	▮▮▮	▮▮▮▮▮	▮▮	▮	▮▮▮	▮▮▮	▮			cladonia lichens
	Dicranum spp.	▮▮▮		▮	▮	▮▮▮▮	▮▮▮▮	▮▮▮▮			heron's-bill mosses
	Aulacomnium palustre								▮▮▮▮▮	▮▮▮▮	glow moss
	Brachythecium spp.				▮		▮	▮▮▮▮		▮▮▮▮▮	ragged mosses
	Drepanocladus uncinatus							▮		▮▮▮▮	sickle moss
	Mnium spp.									▮▮▮▮▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%. ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

ESSFxv2
ENGELMANN SPRUCE–SUBALPINE FIR VERY DRY VERY COLD SUBZONE BIG CREEK VARIANT

The ESSFxv2 includes the highest-elevation forests on leeward slopes of the Coast Mountains and the Camelsfoot Range southeast of Taseko Lakes. It extends from Anvil Mountain in the Chilcotin Ranges eastward to the east slopes of the Camelsfoot Range, overlooking the Fraser River valley. The ESSFxv2 landscape includes low, rounded summits and relatively little-dissected, gentle to moderate slopes. Elevations are primarily 1650–2100 m.

Distinguishing Adjacent Units from the ESSFxv2

The **ESSFxv1** occurs at similar elevations west of the ESSFxv2 on the eastern Chilcotin Ranges and the Pacific Ranges. The **MSxv** occurs below the ESSFxv2 throughout most of its range except on the east slopes of the Camelsfoot Range where the **MSxk** occurs below the ESSFxv2. The **AT** Zone occurs above the ESSFxv2.

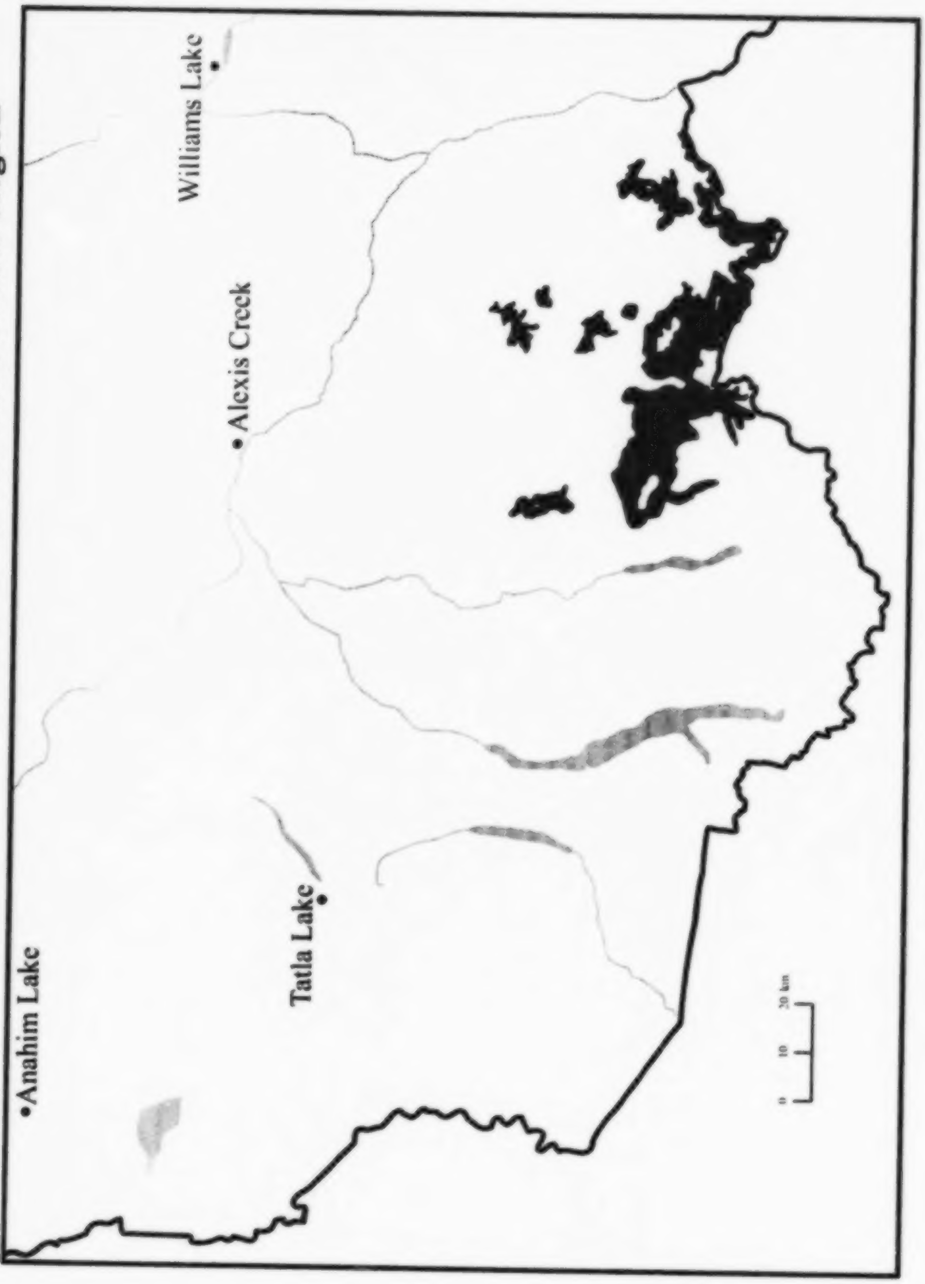
In the **ESSFxv1**, zonal sites have:
- frequently abundant subalpine fir;
- more common grouseberry and soopolallie;
- less common northwestern sedge, wild strawberry, and arctic lupine.

In the **MSxv**, zonal sites have:
- little or no subalpine fir, whitebark pine, mountain sagewort, arctic lupine, or white-flowered rhododendron;
- more abundant red-stemmed feathermoss and bunchberry;
- frequent pinegrass and prickly rose.

wet sites have:
- little or no Sitka valerian, Indian hellebore, or pink mountain-heather.

In the **MSxk**, zonal sites have:
- more abundant red-stemmed feathermoss and bunchberry;
- frequent pinegrass and prickly rose;
- little or no subalpine fir, mountain sagewort, whitebark pine, white-flowered rhododendron, Sitka valerian, Indian hellebore, or pink mountain-heather.

Distribution of ESSFxv2 Variant in the Cariboo Forest Region


Williams Lake
Alexis Creek
Tatla Lake
Anahim Lake
0 10 20 km

In the **AT**, zonal sites have:
- predominantly non-forest vegetation (alpine tundra);
- trees, if present, seldom more than 10 m tall.

Site Units of the ESSFxv2

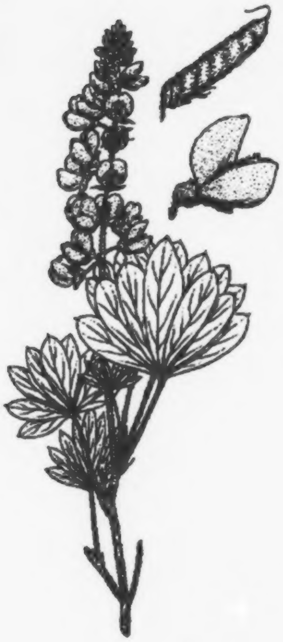
Available data are insufficient at present to develop a site series classification for forests of the ESSFxv2 variant. A classification will be prepared for subsequent additions to this guide. A general description of the vegetation follows.

Zonal sites of the ESSFxv2 are dominated by lodgepole pine forests with an understory of sparse subalpine fir and Engelmann spruce. The undergrowth has a moderate to high cover of herbaceous species but relatively few shrubs. Common juniper is the only shrub species that is nearly always present. Predominant herb species include arctic lupine, dwarf blueberry, heart-leaved arnica, and diverse-leaved cinquefoil. The bryophyte/lichen layer covers a low to moderate proportion of the surface. Principal species are cladonia lichens, pelt lichens, *Dicranum* species, and *Brachythecium* species.

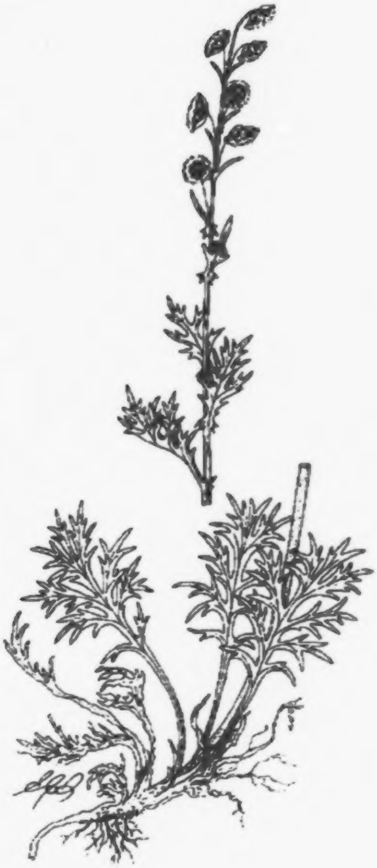
Drier sites Sites drier than zonal sites occur on hill crests, steep south- and west-facing slopes, and coarse soils. They are moderately common. Compared to zonal or other mesic sites, these sites have a greater diversity and cover of grasses and lichens. Warm aspects often have species typical of lower elevations such as nodding onion, saskatoon, and pinegrass.

Wetter sites Sites wetter than zonal sites generally have a greater density of spruce and subalpine fir in the forest canopy. Sites moistened by intermittent or persistent but low-volume seepage water have low amounts of black twinberry, western meadowrue, and glow moss. Wetter sites frequently have, in addition to these species, scrub birch, willows, Sitka burnet, common horsetails, glow moss, sphagnum mosses, and sickle mosses. Wet sites most often occur on toe and depression slope positions, which accumulate cold air.

Non-forested Sites The natural landscape of the ESSFxv2 is mostly forested, but wetlands, wetland complexes, shrub-carrs, and meadows are locally common, especially in the upper Big Creek area. Sedge fens and shrub fens are common wetland types. Meadows and grasslands occur in high-elevation valley bottoms where cold air limits tree growth. The meadows are often similar to alpine communities found at higher elevations. Grasslands also occur on steep south aspects and ridge tops. Altai fescue and Rocky Mountain fescue are common grass species.



Arctic lupine
Lupinus arcticus



Mountain sagewort
Artemisia norvegica

ICHdk
INTERIOR CEDAR–HEMLOCK
DRY COOL SUBZONE

The ICHdk is a small (430 km^2) subzone that occurs just north of Canim Lake along the transition between the Fraser Plateau and the Quesnel Highland. Elevations rise from approximately 900 m in the south near Canim Lake to 1250 m in the north on the edge of the Quesnel Highland.

Distinguishing Adjacent Units from the ICHdk

The **IDFmw2** occurs around Canim Lake at elevations below the ICHdk. The **ICHmk3** and **ICHmw3** occur north and east of the ICHdk in the moister climate of the Quesnel Highland. The ESSFwk1 occurs at higher elevations on mid elevation mountain slopes. The **SBSdw1** occurs to the west of the ICHdk in the drier climates of the Fraser Plateau.

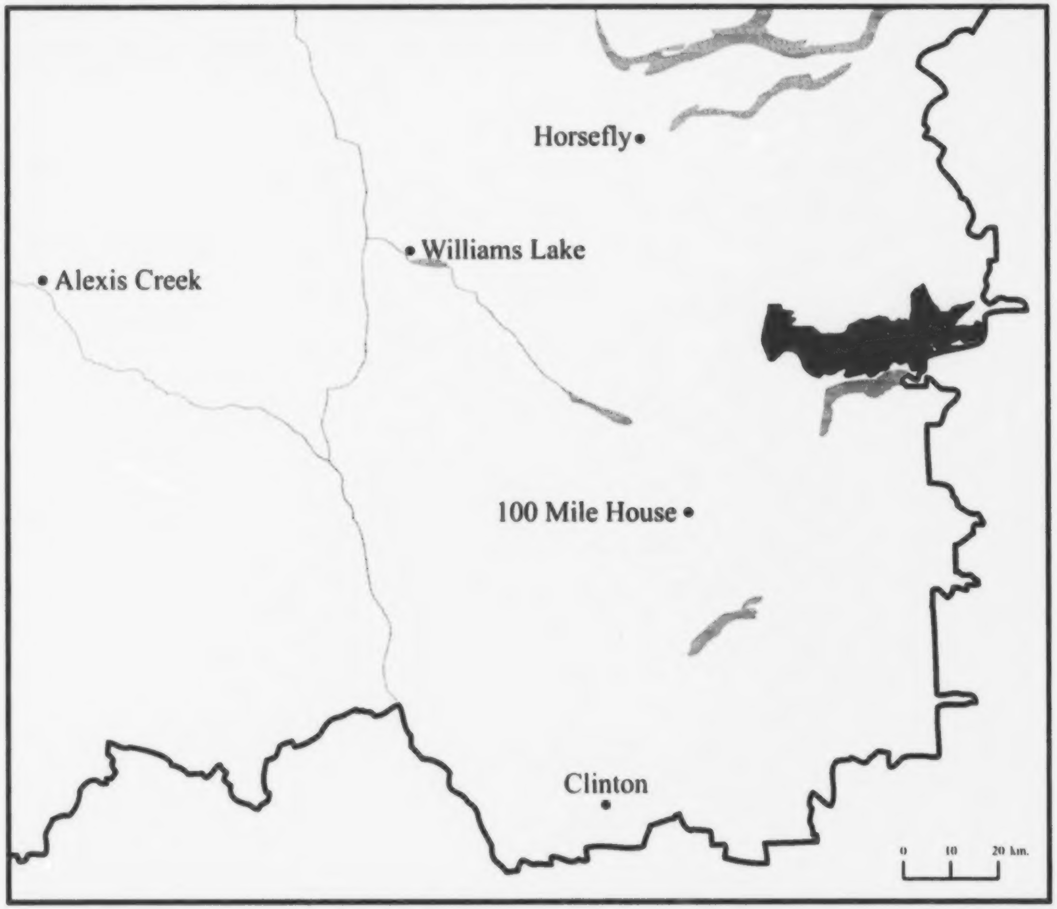
In the **IDFmw2**, zonal sites have:
- Douglas-fir–dominated climax forests;
- pinegrass;
- no bunchberry, black huckleberry, three-leaved foamflower, five-leaved bramble, or subalpine fir.

In the **SBSdw1**, zonal sites have:
- pinegrass;
- Douglas-fir in climax forests;
- no redcedar, foamflower, rosy twistedstalk, or five-leaved bramble.

In the **ICHmk3**, zonal sites have:
- abundant redcedar in the canopy of mature stands;
- abundant thimbleberry.

In the **ICHmw3**, zonal sites have:
- abundant redcedar and western hemlock in the canopy of mature stands.

Distribution of ICHdk Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0
10
20 km.

In the **ESSFwk1**, *zonal sites have:*
- white-flowered rhododendron, Sitka valerian, and Indian hellebore;
- no redcedar, Douglas-fir, or wild sarsaparilla.

Site Units of the ICHdk

Zonal Site Series **01 CwSxw - Falsebox - Wintergreen Site Series** dominates level sites and gently sloping mid to lower slope positions. The mature forest canopy is a mixture of Douglas-fir, hybrid white spruce, and lodgepole pine. Tree regeneration is predominantly subalpine fir, hybrid white spruce, and scattered redcedar. Trembling aspen and paper birch are common. The undergrowth of mature conifer stands has a moderate to high shrub cover consisting of many species including falsebox, thimbleberry, black huckleberry, and birch-leaved spirea. The herbaceous layer is also vigorous and includes several leafy forbs such as wild sarsaparilla and queen's cup. Mosses, especially red-stemmed feathermoss and knight's plume, form a nearly continuous cover.

Drier Sites Sites drier than the zonal site series are common, occurring primarily on upper slopes and ridge crests, coarse-textured soils, and steep south and west aspects. Compared to zonal sites, they generally have more soopolallie, birch-leaved spirea, and lodgepole pine but less total cover of herbaceous species.

02 CwSxw - Soopolallie Site Series occurs primarily on upper slope positions of moderate to steep (>30%) south- and west-facing slopes (Typic Phase). It also occurs on ridge crests where soils are shallow (<50 cm) to bedrock (Shallow Phase). The mature forest canopy is dominated by large Douglas-fir and/or lodgepole pine but may include scattered redcedar and hybrid white spruce in the lower canopy. Tree regeneration is primarily subalpine fir with a few spruce, Douglas-fir, and redcedar. Shrubs have a moderate to high cover, dominated by falsebox and soopolallie, but herbs are usually not abundant on these dry sites. The abundance of soopolallie together with Douglas-fir distinguishes these sites. Red-stemmed feathermoss and wavy-leaved moss may cover up to 50% of the ground surface.

03 CwSxw - Falsebox - Soopolallie Site Series is relatively uncommon. It occurs most commonly on mid to upper slope positions of south- and west-facing slopes with coarse-textured (sand or >70%

coarse fragments) soils. The mature forest canopy is predominantly lodgepole pine. Douglas-fir is infrequent in the canopy and understory. The undergrowth has a moderate cover of shrubs including soopolallie, falsebox, and black huckleberry, but a low diversity of forbs. Red-stemmed feathermoss, knight's plume, and wavy-leaved moss collectively cover most of the surface.

04 CwSxw - Falsebox - Feathermoss Site Series occurs primarily on mid slope position of gentle to moderate (<30%) south-facing slopes. Soils are generally coarse loamy to sandy. Mature forests typically have a Douglas-fir, hybrid white spruce, or occasionally lodgepole pine canopy, and often a high density of subalpine fir and redcedar stems in the regeneration layer. The undergrowth has a sparse cover of shrubs (other than subalpine fir and redcedar) and forbs, but a high percent cover of mosses.

Wetter Sites Forested sites wetter than zonal sites are frequent but usually small and localized. They occur primarily at the base of slopes, in seepage areas, and in local depressions. The vegetation is distinguished from that on drier sites by the presence of moist site indicators including palmate coltsfoot, common mitrewort, and leafy mosses.

05 CwSxw - Thimbleberry Site Series occurs on lower slopes where soils are moistened by low-volume or intermittent seepage during the growing season. The mature forest canopy is relatively open and dominated by hybrid white spruce, lodgepole pine, and occasionally Douglas-fir. A dense shrub layer dominated by thimbleberry is a distinguishing feature of these sites. Other common shrubs include black twinberry, highbush-cranberry, red-osier dogwood, and snowberry. The herb and moss layers have moderate cover.

06 CwSxw - Raspberry - Oak fern Site Series occurs on mid to lower slope positions of north-facing slopes. Soils are moistened by intermittent seepage during the growing season. The mature forest canopy includes hybrid white spruce, subalpine fir, lodgepole pine, and occasionally Douglas-fir. The undergrowth vegetation is distinguished by several moist site indicators including black twinberry, red raspberry, highbush-cranberry, oak fern, foamflower, sweet-scented bedstraw, and clasping twistedstalk. These form well-developed shrub and herb layers. The vegetation is distinguished from that of the /05 unit by less thimbleberry cover.

07 Sxw - Twinberry - Oak fern Site Series occurs at the toe of slopes where seepage and cold air accumulate. It is often adjacent to streams or wetlands. The mature forest canopy is typically open and dominated by large hybrid white spruce and lodgepole pine. Tree regeneration is usually sparse. The undergrowth vegetation is distinguished by a dense shrub layer dominated by species indicative of cold, moist soils. These include black twinberry, hardhack, and willows. Herbaceous vegetation typically has a sparse to moderate cover predominantly of moist site indicators such as trailing raspberry and western meadowrue. A moderate to high cover of mosses is present. The absence or low cover of frost-intolerant species such as Douglas-fir, redcedar, and falsebox distinguishes these sites.

08 Sxw - Devil's club - Lady fern Site Series occurs on lower and toe slope positions where soils are moistened throughout the growing season by intermittent to persistent seepage water. They are primarily on north aspects. Hybrid white spruce, subalpine fir, and scattered Douglas-fir dominate the mature forest canopy. The undergrowth is distinguished by its high cover of devil's club, often accompanied by other moist-site shrubs including red-osier dogwood, thimbleberry, and black twinberry. The herb layer is characterized by abundant ferns as well as other moist-site herbs. The moss layer is sparse and predominantly leafy mosses and *Brachythecium* mosses.

09 Sxw - Horsetail Site Series occurs in wet depressions and other areas where a water table remains near (<50 cm) the surface throughout the growing season. Soils are usually gleyed beneath thick surface organic layers. The mature forest canopy is relatively open and dominated by redcedar and hybrid white spruce. Tree regeneration is relatively sparse. The shrub layer has a low to moderate cover of moist- or wet-site indicators such as black twinberry, red-osier dogwood, devil's club, and highbush-cranberry. The high cover of common horsetail is a distinguishing key feature of the vegetation. Feathermosses occur on mounds, and leafy mosses and *Brachythecium* mosses occur in wet hollows.

Non-forested Sites Non-forested wetlands are uncommon and generally small. Fens and swamps are most common. Grasslands have not been observed.

Key to Site Units of the ICHdk

1a. Moisture regime mesic or drier; no evidence of seepage water or water table within 1 m of surface; slope position crest to lower; common mitrewort, leafy mosses, and palmate coltsfoot absent or incidental (cover <1%).

2a. Soils shallow (<50 cm) to bedrock; slope position usually crest or upper; moisture regime xeric to subxeric.

ICHdk/02 CwSxw - Soopolallie;
/02b Shallow Phase

2b. Soils deeper; slope position upper to lower (rarely crest); moisture regime subxeric to mesic.

3a. Slope gradient moderate to very steep (>20%) and slope aspect SE, S, SW, W (135−280°).

4a Soopolallie abundant (>2% cover but usually >10%); slope position mid or upper and slope gradient usually >30%; moisture regime subxeric or submesic; redcedar regeneration generally not dense.

ICHdk/02 CwSxw - Soopolallie;
/02a Typic Phase

4b. Soopolallie not abundant; slope position usually mid or lower and slope gradient usually <30%; submesic; western redcedar regeneration often dense.

ICHdk/04 CwSxw - Falsebox - Feathermoss

3b. Slope gradient gentle (<20%) or if steep then aspect NW, N, NE, or E (281−360 °, 0−134°).

5a. Moisture regime subxeric or submesic; soils sandy (sand or loamy sand), or coarse fragment content very high (>70%), or slope position crest or upper.

6a. Soopolallie cover >1%; moisture regime subxeric; western redcedar and subalpine fir regeneration sparse; canopy dominated by lodgepole pine.
ICHdk/03 CwSxw - Falsebox - Soopolallie

6b. Soopolallie cover <1%; moisture regime submesic; western redcedar and subalpine fir regeneration usually dense; canopy dominated by Douglas-fir (most common) or lodgepole pine.
ICHdk/04 CwSxw - Falsebox - Feathermoss

5a. Moisture regime mostly mesic (occasionally submesic); soils loamy (rarely silty or clayey); soil coarse fragment content low to moderate (<70%), or slope position mostly mid, lower, or level.
ICHdk/01 CwSxw - Falsebox - Wintergreen

1b. Moisture regime subhygric to subhydric; evidence of seepage water or water table within 1 m of surface; slope position mostly lower, toe, or depression; common mitrewort, leafy mosses, and coltsfoot cover >1%.

7a. Moisture regime subhygric; no evidence of persistent seepage within 50 cm of soil surface; soopolallie cover >1% and oak fern absent or incidental; shrub layer dominated by abundant (>20% cover) thimbleberry.
ICHdk/05 CwSxw - Thimbleberry

7b. Moisture regime subhygric or wetter; evidence of persistent seepage or water table within 50 cm of surface; soopolallie absent or incidental (<1% cover) and oak fern usually abundant (>1% cover); shrub layer various.

8a. Lady fern cover >1% and either devil's club or common horsetail abundant (>10% cover); enchanter's nightshade usually present; moisture regime subhygric to subhydric.

9a. Water table within 60 cm of soil surface during most of the growing season; common horsetail cover >10% and devil's club cover <5%; slope position toe or depression and slope gradient <3%.
ICHdk/09 Sxw - Horsetail

9b. Water table not present within 60 cm of soil surface for most of the growing season; common horsetail cover <10% and devil's club cover usually >5%; slope position lower or toe, and slope gradient often >3%.

ICHdk/08 Sxw - Devil's club - Lady fern

8b. Lady fern absent or incidental and neither devil's club nor common horsetail abundant; enchanter's nightshade usually absent; moisture regime subhygric.

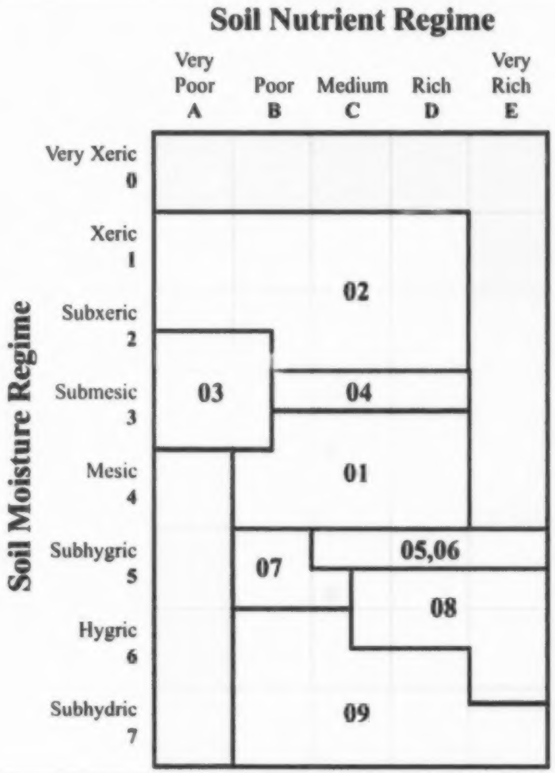
10a. Shrub layer dominated by black twinberry; thimbleberry absent or incidental; usually cold air accumulation areas in toe slope positions adjacent to streams.

ICHdk/07 Sxw - Thimbleberry - Oak fern

10b. Shrub layer not dominated by black twinberry; thimbleberry usually well represented; primarily lower slopes not in cold air accumulation areas.

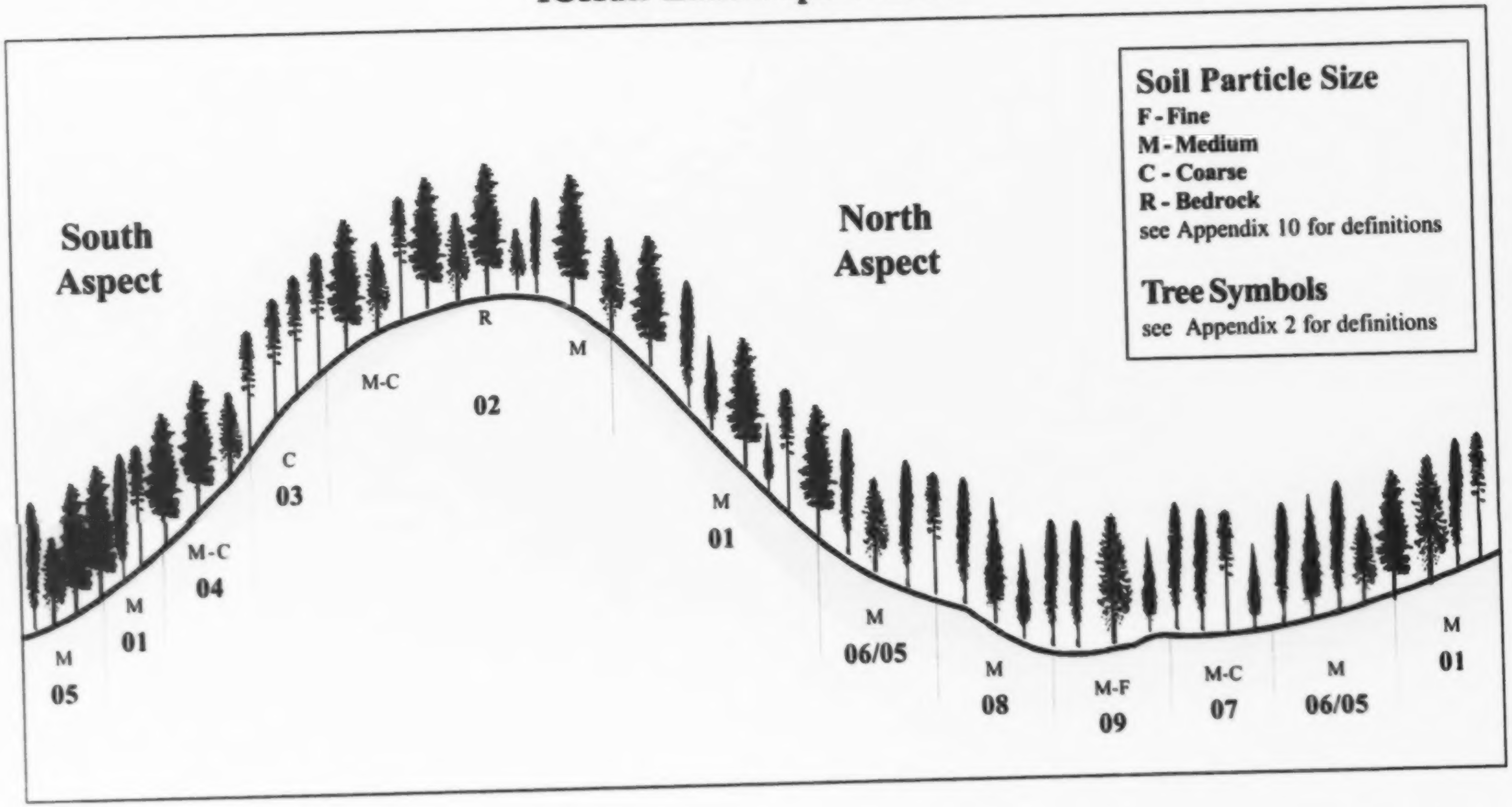
ICHdk/06 CwSxw - Raspberry - Oak fern

ICHdk Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
01
07
05,06
08
09

Site Series	
01	CwSxw - Falsebox - Wintergreen
02	CwSxw - Soopolallie
03	CwSxw - Falsebox - Soopolallie
04	CwSxw - Falsebox - Feathermoss
05	CwSxw - Thimbleberry
06	CwSxw - Raspberry - Oak fern
07	Sxw - Twinberry - Oak fern
08	Sxw - Devil's club - Lady fern
09	Sxw - Horsetail

ICHdk Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M
05
M
01
M-C
04
C
03
M-C
R
02
M
M
01
M
06/05
M
08
M-F
09
M-C
07
M
06/05
M
01

Site Features of ICHdk Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gentle to moderate gradient mid and lower slope sites with mesic or submesic moisture regime	a) dry moderate to steep S and W aspects on upper slopes (Typic Phase); b) crest and upper slope positions with shallow (<50 cm) soils over bedrock (Shallow Phase)	dry S and W aspects on soils with sand texture or very high (>70%) coarse fragment content	mid and lower slope positions on S or W aspects, often with coarse loamy soils; often downslope of /02a	moist lower slopes with loamy soils moistened by low-volume or intermittent seepage; most often on S or W aspects.
Soil Moisture / Nutrient Regimes	mesic (submesic) / poor - rich	xeric, subxeric (submesic) / poor - rich	subxeric, submesic / very poor, poor	submesic / poor - rich	subhygric / medium - very rich
Slope Position	mid (upper - level)	upper, crest	upper, mid	mid	lower
Aspect	all	SE, S, SW, W	all, commonly SE, S, SW, W	all, mostly SE, S, SW, W	all, commonly SE, S, SW, W
Slope Grade (%)	5 - 25	0 - 50	(10) 25 - 50	5 - 25	5 - 15
Soil Texture	(gravelly) loamy	gravelly loamy	gravelly sand, gravelly loamy	loamy (sand)	loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 5 - 10	Hemimor 3 - 5	Hemimor 3 - 4	Hemimor, Mormoder 5 - 7	Hemimor, Mormoder 5 - 11
Occurrence / Size / Distribution	common / moderate / wide	common / small - moderate / wide	uncommon / small - moderate / wide	common / moderate / wide	common / small - moderate / wide

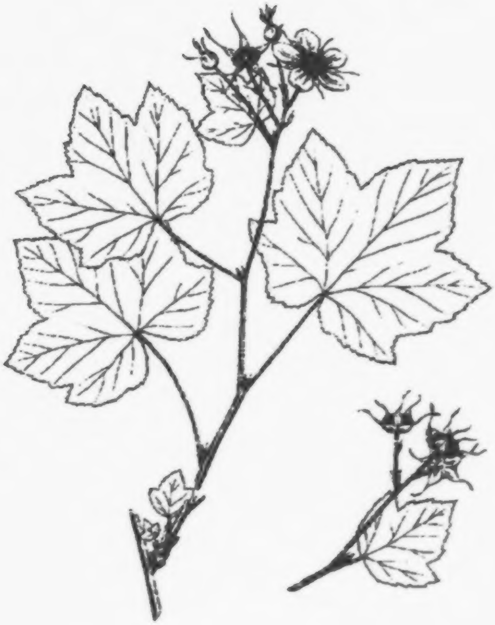
Site Features of ICHdk Site Series (continued)

Site Series	06	07	08	09
Key Features	mid to lower slopes moistened by intermittent seepage; mostly N and E aspects	moist toe slopes that accumulate seepage water and cold air drainage; moist, cold sites often adjacent to streams	very moist lower and toe slopes receiving persistent seepage; primarily on N- or E - facing slopes	wet toe slopes and depressions with near-surface (< 30 cm) water table; wet, cold sites
Soil Moisture / Nutrient Regimes	subhygric / medium - very rich	subhygric / poor, medium	subhygric, hygric / medium - very rich	hygric, subhydric / poor - very rich
Slope Position	mid, lower	toe	lower, toe	toe, depression
Aspect	all, mostly NW, N, NE, E	none	all, mostly NW, N, NE, E	none
Slope grade (%)	5 - 30	< 5	0 - 45	< 5
Soil Texture	loamy	loamy (gravelly sand)	loamy, silty	loamy, silty, (sand)
Humus Form and Thickness (cm)	Hemimor, Mormoder, Leptomoder 6 - 45	Moder 6 - 10	Leptomoder, Hydromor 9 - 55	Hydromor, Histomoder 10 - 50
Occurrence / Size / Distribution	common / small - moderate / wide	uncommon / small - moderate / wide	uncommon / small / wide	common / small / wide

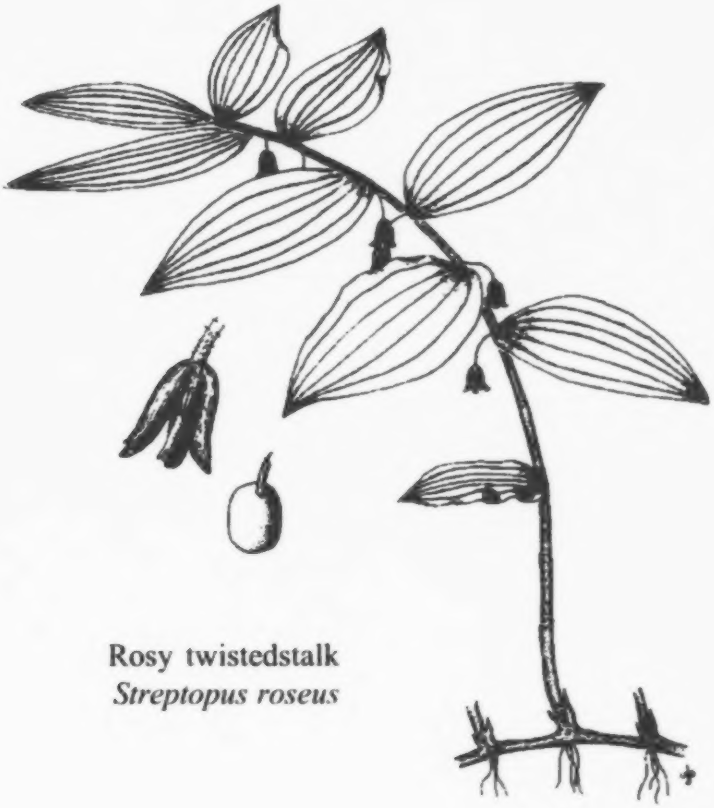
ICHdk Vegetation Table

	Site Unit	02	03	04	01	05	06	07	08	09	
Tree Layer	*Pseudotsuga menziesii*	█████		█████	█████	████					Douglas-fir
	Populus tremuloides	███		███	███	███	███				trembling aspen
	Pinus contorta	█████	█████	████	███	███	███	███		█	lodgepole pine
	Abies lasiocarpa	███		███	█	███	███		████	█	subalpine fir
	Picea engelmannii x *glauca*	███	███	████	████	█████	█████	█████	█████	████	hybrid white spruce
Shrub Layer	*Acer glabrum*	███									Douglas maple
	Shepherdia canadensis	████	███		█	███					soopolallie
	Pachistima myrsinites	█████	███	████	█████	████	███	██			falsebox
	Amelanchier alnifolia	███	██	█	██	███		███		█	saskatoon
	Thuja plicata	███	███	█████	███	███	███			█	western redcedar
	Vaccinium membranaceum	███	████	██	███	███		██	██	██	black huckleberry
	Cornus stolonifera	█	█		██	███	███		███	███	red-osier dogwood
	Lonicera involucrata		██		██	███	███	████	███	████	black twinberry
	Rubus parviflorus				███	█████	████		████	██	thimbleberry
	Ribes lacustre				██	██	███	███	███	███	black gooseberry
	Spiraea douglasii							███			hardhack
	Alnus tenuifolia							███	███	███	mountain alder
	Oplopanax horridus				█				█████	███	devil's club
Herb Layer	*Hieracium albiflorum*	██									white-flowered hawkweed
	Chimaphila umbellata	███	█	██	██						prince's pine
	Goodyera oblongifolia	██	█	██	██	██	██				rattlesnake-plantain
	Linnaea borealis	███	███	██	███	███	██	███	██	█	twinflower
	Aralia nudicaulis	███	█	█	███	████	███		██	█	wild sarsaparilla
	Cornus canadensis	███	████	██	███	████	███	███	███	███	bunchberry
	Rubus pedatus		███		█		███	███	███		five-leaved bramble
	Streptopus roseus	█	█		██	███	███	███	███	██	rosy twistedstalk
	Streptopus amplexifolius				█	██	██	██	███	███	clasping twistedstalk
	Tiarella trifoliata				█	███	███	███	███	███	foamflower
	Rubus pubescens				█	███	██	███	███	█	trailing raspberry
	Gymnocarpium dryopteris		█				████	████	█████	████	oak fern
	Equisetum arvense							██	███	█████	common horsetail
	Circaea alpina								███	██	enchanter's nightshade
	Athyrium filix-femina								████	█████	lady fern
	Carex disperma									██	soft-leaved sedge
Moss Layer	*Dicranum polysetum*	███	███	███	█						wavy-leaved moss
	Pleurozium schreberi	█████	█████	█████	█████	████	███	█████	███	█	red-stemmed feathermoss
	Rhytidiadelphus triquetrus	███	██	███	███	████	███	███	███	█	electrified cat's-tail moss
	Ptilium crista-castrensis	███	████	█████	█████	████	████	█████	███	███	knight's plume
	Brachythecium spp.		█	█	███	███	███	███	████	███	ragged mosses
	Mnium spp.				█	███	███	███	████	████	leafy mosses

[a] Species abundance: █ present in 40–60% of plots surveyed; ██ >60% of plots, mean cover <1%; ███ >60% of plots, mean cover 1–7%; ████ >60% of plots, mean cover >7–15%; █████ >60% of plots, mean cover >15%



Thimbleberry
Rubus parviflorus



Rosy twistedstalk
Streptopus roseus

ICHmk3
INTERIOR CEDAR–HEMLOCK MOIST COOL SUBZONE HORSEFLY VARIANT

The ICHmk3 occurs on the gently rolling terrain along the eastern flank of the Fraser Plateau and adjacent portions of the Quesnel Highland from Quesnel Lake in the north to McNeil Lake in the south. A small, northern outlier of the ICHmk3 occurs at the southwest corner of Bowron Lake Park, near Spectacle Lake. A second outlier occurs immediately south of the west end of Canim Lake. The ICHmk3 occurs at elevations between 780 and 1250 m.

Distinguishing Adjacent Units from the ICHmk3

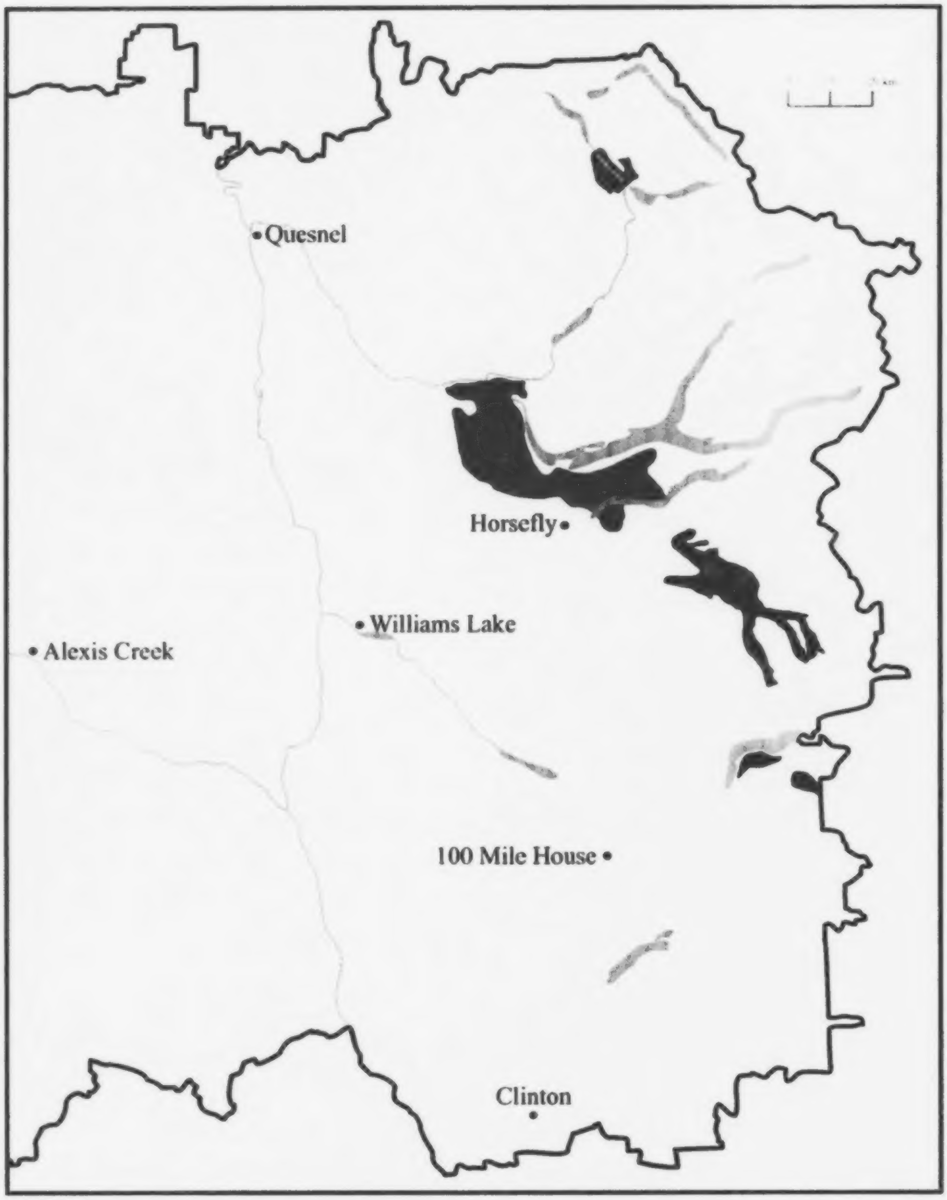
The **SBSdw1** occurs to the west in drier climates of the Fraser Plateau. The **SBSmw** replaces the ICHmk3 north of the Quesnel River where the climate is cooler. The **ICHwk2** occurs in the wetter and milder climate east of the ICHmk3, primarily in valleys of the higher-relief terrain of the Quesnel Highland. The **ESSFwk1** occurs above the ICHmk3 in the colder, snowier climates above 1250 m. The **ICHdk** replaces the ICHmk3 south of Big Timothy Mountain where the climate is drier. The northern outlier of the ICHmk3 is bounded by the **SBSwk1** and the **ICHwk4.** The southern outlier is adjacent to the warmer, drier **IDFmw** at lower elevations.

In the **ICHdk**, zonal sites have:
- more abundant and vigorous growth of shrubs and herbaceous plants;
- common lodgepole pine, thimbleberry, and saskatoon;
- very little redcedar in the codominant layer;
- less conspicuous moss layer.

In the **ICHwk2**, zonal sites have:
- western hemlock;
- pipecleaner moss;
- uncommon subalpine fir in overstory of mature stands;
- much less dense understory of redcedar in mature stands;
- common oval-leaved blueberry.

In the **ICHwk4**, zonal sites have:
- western hemlock;
- pipecleaner moss;

Distribution of ICHmk3 Variant in the Cariboo Forest Region


Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton

- much less dense understory of redcedar in mature stands;
- common oval-leaved blueberry.

In the **SBSdw1**, zonal sites have:

- pinegrass;
- frequent lodgepole pine stands;
- no redcedar, five-leaved bramble, rosy twistedstalk, or foamflower;
- little or no subalpine fir in canopy of mature stands.

In the **SBSmw**, zonal sites have:

- western mountain-ash, showy aster, and trailing raspberry;
- no redcedar or five-leaved bramble.

In the **SBSwk1**, zonal sites have:

- common oak fern;
- no redcedar, Douglas-fir, or prince's pine;
- uncommon falsebox.

In the **ESSFwk1**, zonal sites have:

- white-flowered rhododendron, Sitka valerian, and Indian hellebore;
- no redcedar, Douglas-fir, or wild sarsaparilla.

Site Units of the ICHmk3

Zonal Site Series **01 CwSx - Falsebox - Knight's plume Site Series** dominates the ICHmk3 landscape. It occurs on gentle to moderately sloping terrain with deep, medium-textured soils. Late seral and climax stands have closed canopies dominated by western redcedar and subalpine fir. Hybrid white spruce is frequently scattered throughout the stand. Western hemlock rarely occurs in the overstory and only occasionally occurs in the understory. A very dense cover of redcedar and subalpine fir regeneration is a characteristic. Seral stands are frequently dominated by Douglas-fir and lodgepole pine. Paper birch is frequently present in seral stands and occasionally forms nearly pure stands. The undergrowth, except for the dense regeneration layer, contains a moderate to sparse cover of falsebox and black huckleberry as well as several forbs including wild sarsaparilla, foamflower, queen's cup, bunchberry, twinflower, and five-leaved bramble. Ferns are generally lacking. The moss layer usually forms a nearly continuous carpet dominated by red-stemmed feathermoss, step moss, and knight's plume.

Drier Sites Sites drier than zonal are relatively common but small. They occur primarily on crests and steep upper slopes on the numerous hills that occur in the variant. Compared to zonal sites, dry-site forests have a more open canopy, relatively sparse tree regeneration, several dry-site species, and a less continuous cover of mosses.

02 FdCw - Wavy-leaved moss Site Series occurs on hill crests with thin gravelly soils over bedrock. Bedrock is frequently exposed. These are very dry sites with open forest canopies dominated by Douglas-fir and lodgepole pine. Tree regeneration is sparse and consists of scattered, poorly growing redcedar, subalpine fir, Douglas-fir, and lodgepole pine. The undergrowth contains several dry-site species including common juniper, soopolallie, prickly rose, pussy-toes, white-flowered hawkweed, western fescue, and rough-leaved ricegrass. Red-stemmed feathermoss and wavy-leaved moss are abundant. Abundant lichens distinguish this site series from the /03.

03 CwSxw - Soopolallie Site Series occurs on steep south- or west-facing mid to upper slopes with deep soils. The forest canopy is dominated by Douglas-fir or less frequently by lodgepole pine. In addition, redcedar, subalpine fir, and hybrid white spruce frequently occur in the lower canopy. Regeneration, often dense, is dominated by redcedar and subalpine fir. The undergrowth vegetation has a small to moderate cover characterized by scattered birch-leaved spirea, saskatoon, falsebox, prince's pine, showy aster, western fescue, and rough-leaved ricegrass. The moss layer is well developed but less continuous than that of zonal sites.

Wetter Sites Forested sites that are wetter than zonal sites are common on lower slopes, in valley bottoms, and in small depressions. The presence of ferns, thimbleberry, devil's club, sweet-scented bedstraw, and mountain sweet-cicely, and the abundance of leafy mosses, distinguishes these sites from zonal and drier sites.

04 CwSxw - Oak fern - Cat's-tail moss Site Series occurs on sites that are slightly more moist (mesic–subhygric) than zonal sites. They occur primarily on mid and lower slope positions where they receive low volumes of intermittent seepage. Soils are frequently mottled and forest floors are relatively thick (7–12 cm). The forest canopy is moderately closed and dominated by redcedar, with subalpine fir and hybrid white spruce in the lower canopy. Regeneration is dominated by redcedar and is often moderately dense. In addition to species common on zonal sites, characteristic species on these sites include devil's club, oak fern, rosy twistedstalk, and sweet-scented bedstraw. The moss layer is typically well developed and dominated by electrified cat's-tail moss, woodsy ragged moss, and leafy mosses.

05 SxwCw - Oak fern Site Series includes moist sites on mid and lower slopes that receive intermittent, low-volume seepage during the growing season. In contrast to the /04, they are usually cold air accumulation sites associated with streams. The forest canopy is dominated by subalpine fir, hybrid white spruce, and western redcedar. Tree regeneration is typically dense and dominated by subalpine fir, hybrid white spruce, and redcedar. The typically dense undergrowth vegetation includes thimbleberry, black twinberry, red osier dogwood, fringed aster, Columbia brome, trailing raspberry, and creamy peavine. Unlike the /04 site series, devil's club and ferns are typically lacking or occur only with low cover in this site series. The moss layer is dominated by feathermosses, electrified cat's-tail moss, woodsy ragged moss, and leafy mosses.

06 CwHw - Devil's club - Lady fern Site Series occurs on lower and toe slope sites that receive seepage throughout most of the growing season. They are often associated with stream channels. The forest canopy varies from open to moderately closed and is dominated by hybrid white spruce, subalpine fir, and western redcedar. Tree regeneration is sparse to moderately dense and consists of the same species that dominate the canopy. Abundant devil's club and ferns (especially lady fern and oak fern) distinguish these sites from other wet sites in the ICHmk3. The moss layer is often patchy.

07 CwSxw - Devil's club - Horsetail Site Series includes the wettest forested sites in the ICHmk3. They occur on toe slope positions and in depressions with a water table at or near the soil surface throughout the growing season. They are often associated with stream channels. The soil surface is usually mounded, and standing water is frequently present between the mounds. Soils are either organic or strongly gleyed. The forest canopy is open to moderately closed and dominated by hybrid white spruce, western redcedar, and subalpine fir. Tree regeneration is primarily redcedar and subalpine fir. The undergrowth is characterized by devil's club, black gooseberry, black twinberry, ferns, common horsetail, and clasping twistedstalk. The moss layer is dominated by leafy mosses.

Non-forested Sites Non-forested wetlands are generally uncommon and small. Fens occur in some closed depressions where the soils remain very wet throughout the year. Vegetation of these sites usually contains scrub birch, Labrador tea, willows, sedges, brown mosses, and sphagnum moss. Grasslands are not present in the ICHmk3, and the natural upland landscapes are entirely forested with the exception of rock cliffs, talus slopes, and similar features.

Key to Site Units of the ICHmk3

1a. Soils shallow (<50 cm); bedrock frequently exposed; crest slope position; lichens abundant.

ICHmk3/02 FdCw - Wavy-leaved moss

1b. Soils deeper (>50 cm); bedrock seldom exposed; not crest slope position; lichens not abundant.

2a. Slope steep (>50 %); parent material usually colluvial; upper slope position.

3a. Aspect SE, S, SW, or W; canopy of mature forest open; rough-leaved ricegrass and dog lichen usually present; common mitrewort, three-leaved foamflower, five-leaved bramble, and woodsy ragged moss absent or incidental.

ICHmk3/03 CwSxw - Soopolallie

3b. Aspect NW, N, NE, or E; mature canopy closed; common mitrewort, three-leaved foamflower, five-leaved bramble, and woodsy ragged moss present; rough-leaved ricegrass and dog lichen absent.

ICHmk3/01 CwSxw - Falsebox - Knight's plume

2b. Slope gentler (<50%); slope position variable; parent material usually not colluvium.

4a. Moisture regime submesic or mesic; moss layer nearly continuous and "carpet-like"; prince's pine present; oak fern cover <10%; black twinberry, red-osier dogwood, spiny wood fern, and horsetails absent; slope position upper or mid.

ICHmk3/01 CwSxw - Falsebox - Knight's plume

4b. Moisture regime subhygric (occasionally mesic) or wetter; moss layer not "carpet-like"; prince's pine absent; oak fern cover >10% **or** black twinberry, red-osier dogwood, spiny wood fern, or horsetails present; slope position mostly lower or toe.

5a. Free water not present within 50 cm of surface except possibly for short periods early in the growing season; soft-leaved sedge absent.

6a. Canopy of mature stands dominated by western redcedar; shrub layer (excluding tree regeneration) relatively sparse (<10 % cover); cover of devil's club <5%; black twinberry and red-osier dogwood absent or incidental.
ICHmk3/04 CwSxw - Oak fern - Cat's-tail moss

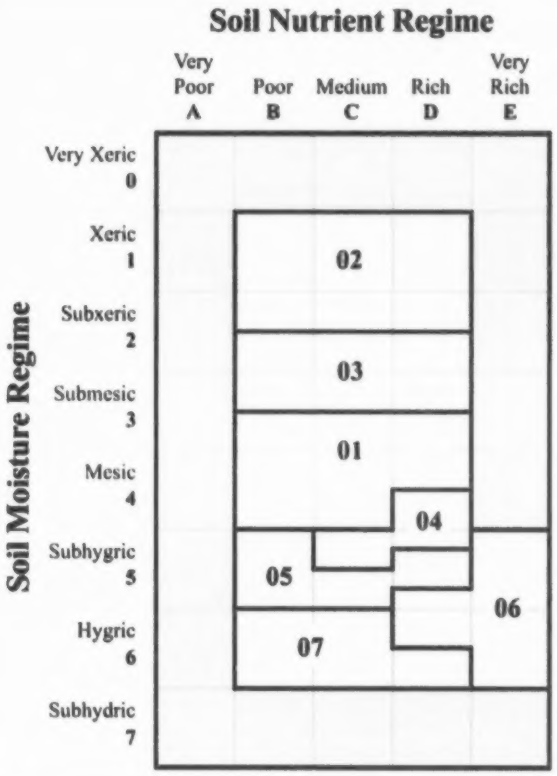
6b. Canopy of mature stands dominated by hybrid white spruce and/or subalpine fir (western redcedar often present); shrub layer of mature stands usually dense; cover of devil's club >5% **or** black twinberry and red-osier dogwood present.

7a. Canopy of mature stands dominated by western redcedar; devil's club abundant (cover >20% **and** greater than the combined cover of black twinberry and thimbleberry); ferns abundant (combined cover >15%).
ICHmk3/06 CwHw - Devil's club - Lady fern

7b. Canopy of mature stands not dominated by western redcedar; devil's club not abundant (<1% cover and less than the combined cover of black twinberry and thimbleberry); ferns not abundant (combined cover <15%); usually cold air accumulation sites.
ICHmk3/05 SxwCw - Oak fern

5b. Free water present within 50 cm of soil surface for entire growing season; soft-leaved sedge present.
ICHmk3/07 CwSxw - Devil's club - Horsetail

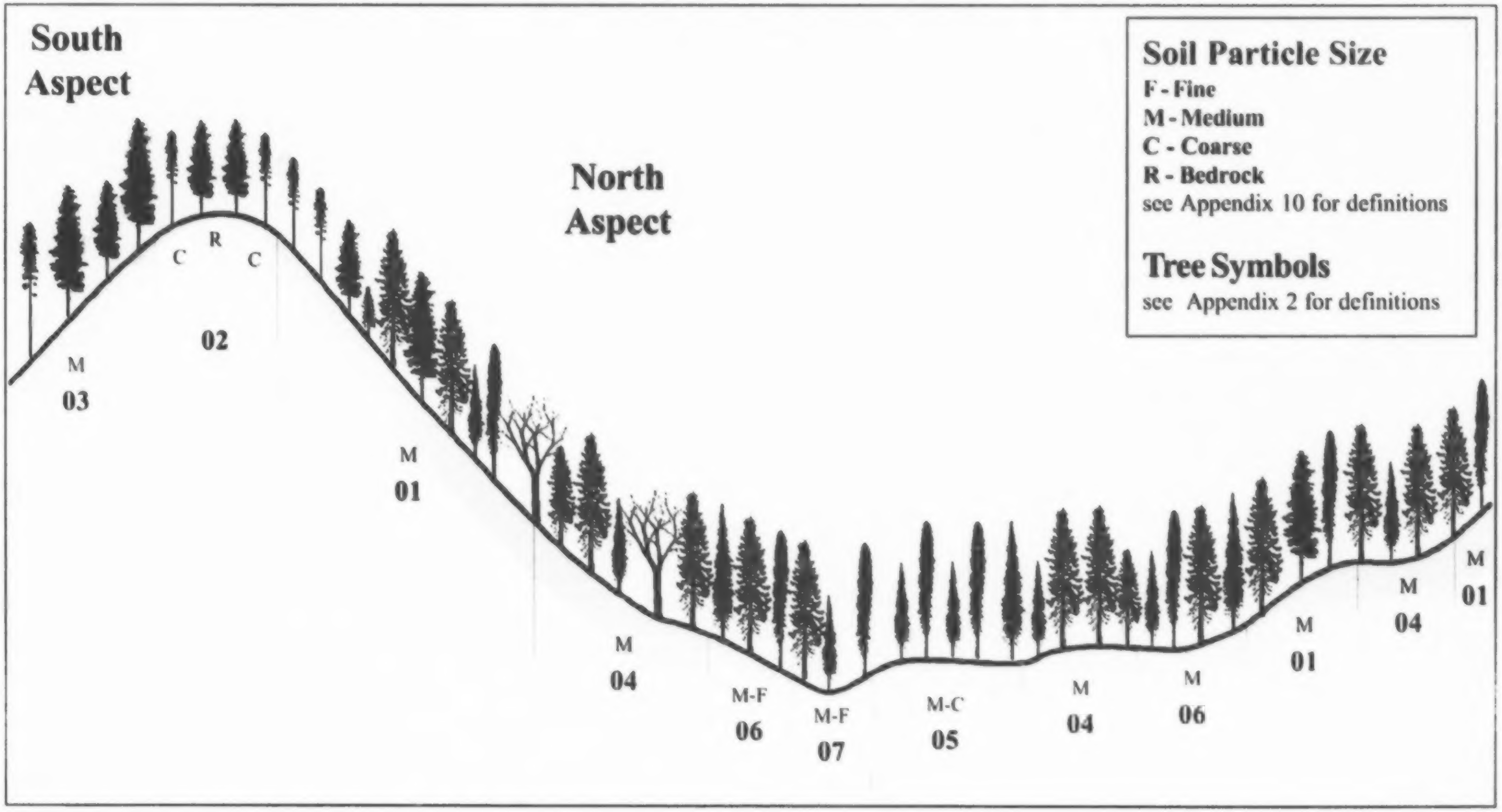
ICHmk3 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
01
04
05
06
07

Site Series

01	CwSxw - Falsebox - Knight's plume
02	FdCw - Wavy-leaved moss
03	CwSxw - Soopolallie
04	CwSxw - Oak fern - Cat's-tail moss
05	SxwCw - Oak fern
06	CwHw - Devil's club - Lady fern
07	CwSxw - Devil's club - Horsetail

ICHmk3 Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M
03
C
R
C
02
M
01
M
04
M-F
06
M-F
07
M-C
05
M
04
M
06
M
01
M
04
M
01

Site Features of ICHmk3 Site Series

Site Series	/01	/02	/03	/04
Key Features	zonal and other gently to moderately sloping sites with mesic/near mesic moisture regime; also some steep E- or N-facing slopes.	hill and ridge crests with shallow (< 50 cm) soils over bedrock.	upper slope positions on steep (> 50%) S- or W-facing slopes; loamy soils.	moist mid and lower slope positions with low volumes of intermittent seepage water; not cold air accumulation sites.
Soil Moisture/ Nutrient Regimes	submesic, mesic / poor - rich	xeric, subxeric / poor - rich	submesic (subxeric) / poor - rich	mesic, subhygric / medium, rich
Slope Position	middle (upper)	crest	upper	middle, lower
Aspect	all	all	SE, S, SW, W	all
Slope Grade (%)	0 - 30 (60)	< 10	> 50	10 - 20 (35)
Soil Texture	gravelly loamy	gravelly loamy	gravelly loamy	loamy
Humus Form and Thickness (cm)	Hemimor (Humimor) 3 - 8	Xeromor, Hemimor 2 - 5	Hemimor, Hemihumimor 2 - 5	Hemimor (Humimor) 4 - 12
Occurrence / Size / Distribution	predominant / moderate / wide	common / small - moderate / wide	common / small - moderate / wide	common / moderate / wide

Site Features of ICHmk3 Site Series (continued)

Site Series	/05	/06	/07
Key Features	moist lower and toe slope sites with intermittent seepage and cold air accumulation; usually in valley bottoms.	very moist lower and toe slope sites with persistent seepage; not cold air accumulation sites.	wet toe slope positions and depressions with near-surface (< 50 cm) water table.
Soil Moisture/ Nutrient Regimes	subhygric (mesic) / poor - rich	subhygric (hygric) / rich, very rich	hygric / poor - rich
Slope Position	middle, lower, level	lower, toe (middle)	toe, depression
Aspect	all	all	none
Slope Grade (%)	5 - 40	0 - 10 (25)	< 5
Soil Texture	variable	loamy, silty	variable
Humus Form and Thickness (cm)	Humimor (Hemimor) 3 - 8	Humimor, Hydromoder 6 - 25	Hydromoder, Hydromor 21 - 80
Occurrence / Size/ Distribution	common / moderate / wide	common / small - moderate / wide	uncommon / small / wide

ICHmk3 Vegetation Table[a]

	Site Unit	02	03	01	04	05	06	07	
Tree Layer	*Pinus contorta*	▮▮▮							lodgepole pine
	Picea engelmannii x glauca	▮▮▮	▮▮▮	▮▮▮▮	▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
	Pseudotsuga menziesii	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮				Douglas-fir
	Thuja plicata		▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	western redcedar
	Abies lasiocarpa		▮▮▮	▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	subalpine fir
Shrub Layer	*Juniperus communis*	▮▮▮							common juniper
	Acer glabrum	▮▮▮	▮						Douglas maple
	Mahonia aquifolium	▮▮▮	▮			▮			tall Oregon-grape
	Shepherdia canadensis	▮▮▮	▮				▮▮▮▮▮		soopolallie
	Pachistima myrsinites	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		falsebox
	Oplopanax horridus			▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	devil's club
	Rubus parviflorus		▮		▮▮	▮▮▮▮	▮▮▮		thimbleberry
	Cornus stolonifera					▮▮▮		▮▮▮	red-osier dogwood
	Lonicera involucrata					▮▮▮		▮▮▮	black twinberry
Herb Layer	*Festuca occidentalis*	▮▮▮	▮▮						western fescue
	Oryzopsis asperifolia	▮▮▮	▮▮▮						rough-leaved ricegrass
	Aster conspicuus	▮▮▮	▮						showy aster
	Chimaphila umbellata	▮▮▮	▮▮▮▮	▮▮▮			▮▮▮▮		prince's pine
	Aralia nudicaulis	▮▮	▮	▮▮▮	▮▮▮	▮▮▮	▮▮		wild sarsaparilla
	Cornus canadensis		▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	bunchberry
	Mitella nuda			▮▮	▮▮	▮▮▮		▮▮▮	common mitrewort
	Tiarella trifoliata		▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	foamflower
	Viola orbiculata			▮▮	▮▮	▮	▮▮▮		round-leaved violet
	Galium triflorum				▮▮	▮▮	▮▮▮	▮▮▮	sweet-scented bedstraw
	Streptopus roseus			▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮	rosy twistedstalk
	Dryopteris expansa				▮▮		▮▮▮	▮▮▮	spiny wood fern
	Gymnocarpium dryopteris		▮	▮	▮▮▮▮▮	▮	▮▮▮▮	▮▮▮▮	oak fern
	Streptopus amplexifolius				▮	▮▮	▮▮	▮▮▮	clasping twistedstalk
	Athyrium filix-femina				▮	▮	▮▮	▮▮▮▮	lady fern
	Rubus pubescens					▮▮▮	▮▮▮		trailing raspberry
	Cinna latifolia							▮	nodding wood-reed
	Circaea alpina							▮▮▮	enchanter's nightshade
	Equisetum arvense							▮▮▮▮	common horsetail
Moss Layer	*Cladonia / Cladina spp.*	▮▮▮							cladonia lichens / reindeer lichens
	Peltigera aphthosa	▮▮▮	▮▮▮	▮			▮▮▮▮		freckle pelt
	Dicranum polysetum	▮▮▮▮	▮▮▮▮				▮▮▮		wavy-leaved moss
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮	red-stemmed feathermoss
	Rhytidiadelphus triquetrus	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	electrified cat's-tail moss
	Hylocomium splendens	▮▮▮	▮▮▮▮	▮▮▮▮	▮	▮▮▮		▮	step moss
	Plagiomnium medium				▮	▮▮▮		▮▮▮	common leafy moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%.

ICHmw3
INTERIOR CEDAR–HEMLOCK
MOIST WARM SUBZONE
THOMPSON VARIANT

The ICHmw3 occurs primarily in the Kamloops Forest Region in the Quesnel and Shuswap highlands. It has a minor area (approximately 32 km^2) within the Cariboo Forest Region on low- to middle-elevation slopes in the Spanish Creek area north of Mahood Lake.

Distinguishing Adjacent Units from the ICHmw3 (Cariboo Forest Region only)

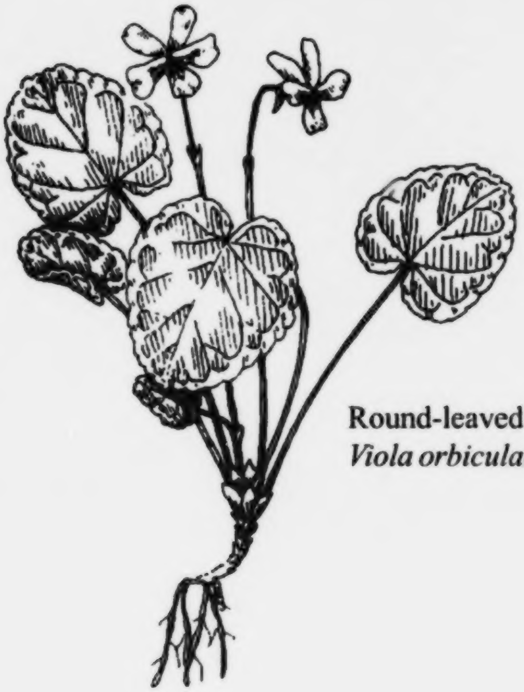
The **ESSFwk1** replaces the ICHmw3 at higher elevations, generally above 1250 m. The **ICHdk** occurs at lower elevations and in the drier climates west of the ICHmw3.

In the **ESSFwk1**, zonal sites have:
- white-flowered rhododendron and Sitka valerian;
- no western hemlock or Douglas-fir;
- little or no falsebox.

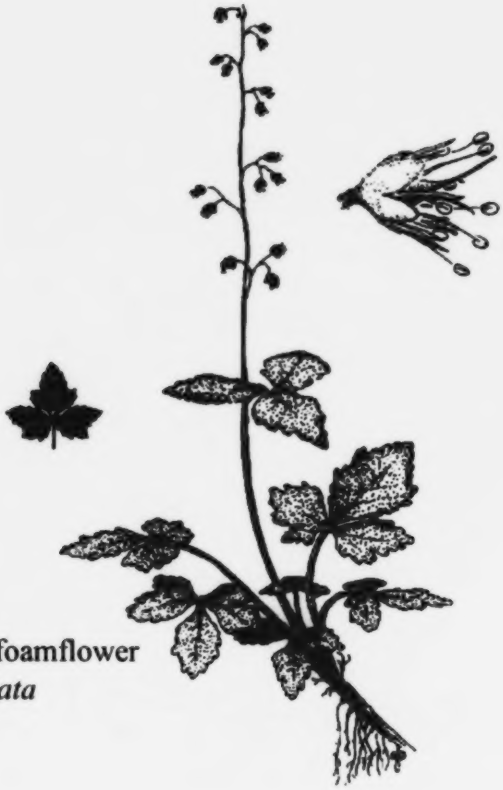
In the **ICHdk**, zonal sites have:
- no western hemlock;
- common saskatoon, birch-leaved spirea, and soopolallie.

Site Units of the ICHmw3

Site units of the ICHmw3 in the Kamloops Forest Region have been described by Lloyd *et al.* (1990) and generally apply to the Cariboo Forest Region. Refer to Lloyd *et al.* (1990) for a description of these units.



Round-leaved violet
Viola orbiculata



Three-leaved foamflower
Tiarella trifoliata

ICHwk2
INTERIOR CEDAR–HEMLOCK
WET COOL SUBZONE
QUESNEL VARIANT

The ICHwk2 occurs primarily in moist valleys of the Quesnel Highland and Cariboo Mountains south of Mitchell Lake. It is centred on the Quesnel Lake area and generally occurs at elevations between 725 and 1250 m.

Distinguishing Adjacent Units from the ICHwk2

The **ICHwk4** replaces the ICHwk2 at similar elevations in the Cariboo and Matthew river valleys. The **ICHmk3** occurs west and south of the ICHwk2 in drier climates at the eastern edge of the Fraser Plateau. The **SBSmw** borders a very short segment of the ICHwk2 boundary near Quesnel Forks. The **ESSFwk1** occurs above the ICHwk2 throughout its distribution.

In the **ICHwk4**, zonal sites have:
- more frequent subalpine fir and hybrid white spruce;
- no western yew.

In the **ICHmk3**, zonal sites have:
- no western hemlock.

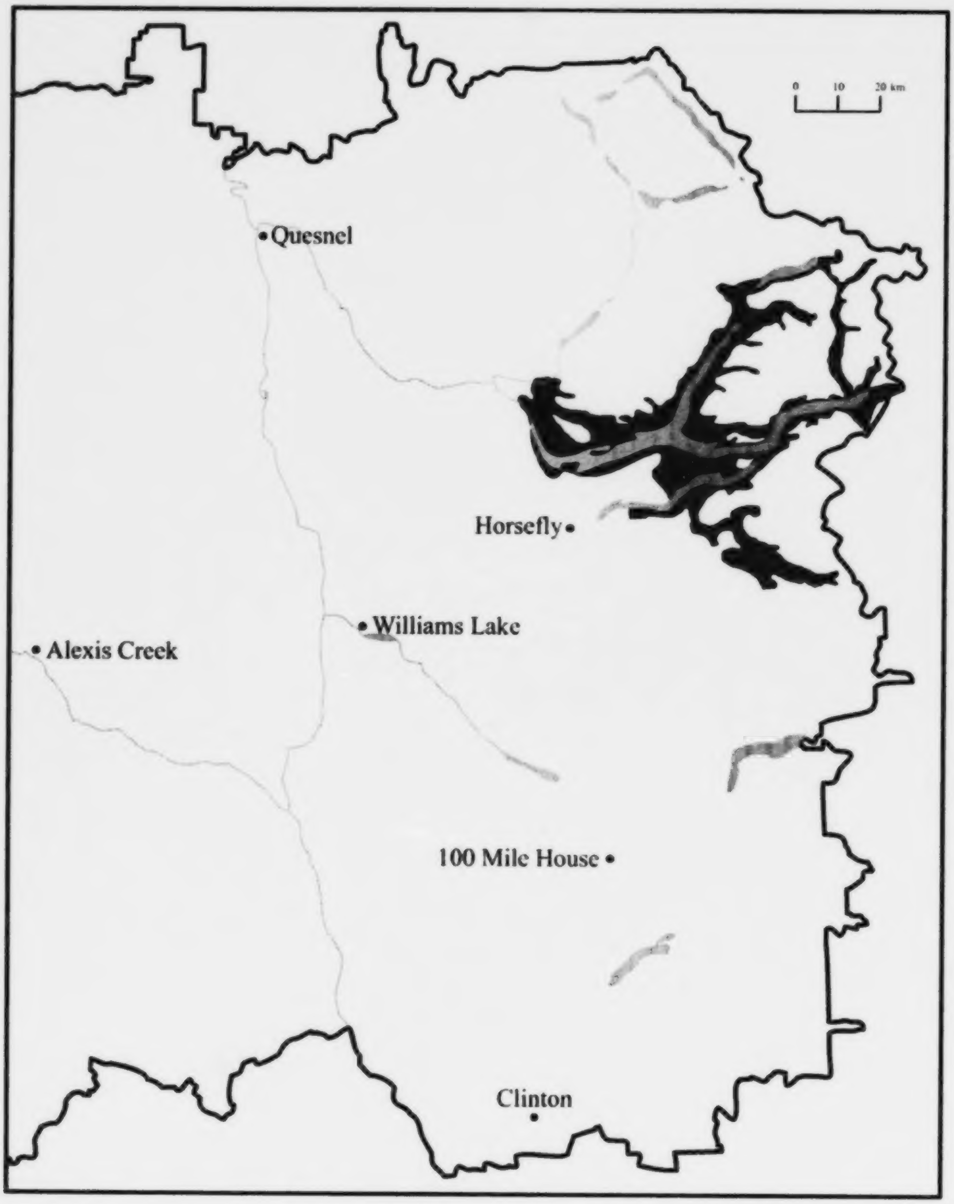
In the **SBSmw**, zonal sites have:
- climax forests with little or no redcedar or western hemlock in the canopy.

In the **ESSFwk1**, zonal sites have:
- white-flowered rhododendron and Sitka valerian;
- no western hemlock or redcedar.

Site Units of the ICHwk2

Zonal Site Series **01 CwHw - Oak fern Site Series** is the most extensive site series in the ICHwk2. It occurs on gently to moderately sloping sites with submesic and mesic (/01a Typic Phase) to subhygric (/01b Moist Phase) moisture regimes and medium-textured soils. It occasionally occurs on coarse-textured soils where intermittent seepage

Distribution of ICHwk2 Variant in the Cariboo Forest Region


0 10 20 km
Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton

is present. Late seral and climax forests are dominated by western hemlock and western redcedar. A few hybrid white spruce and subalpine fir are often present. Douglas-fir is the principal seral species and, due to its long life, is present in many mature stands. Other common seral tree species are trembling aspen, paper birch, and lodgepole pine. Tree regeneration in both early and late seral stands is principally western hemlock and redcedar. The undergrowth of mature stands includes a sparse to moderate cover of shrubs, primarily oval-leaved blueberry, black huckleberry, and falsebox. A moderate cover of herbs includes many species. In the Moist Phase, devil's club is present with up to 10% cover and oak fern is often abundant. The nearly continuous moss cover is dominated by boreal feathermosses and pipecleaner moss.

Drier Sites Sites drier than zonal are common. They occur on crest and steep upper slopes with shallow soils and on gentle slopes with sandy gravelly soils. These sites have less redcedar and less cover of forbs than zonal sites.

02 HwCw - Cladonia Site Series occurs on hill crests and steep upper slopes with thin, often gravelly soils and frequently exposed bedrock. Soil parent materials are derived from acidic rocks and consequently have relatively poor nutrient status. Tree productivity is generally poor. The mature forest canopy is open and dominated by western hemlock. Lodgepole pine typically dominates seral stands. Tree regeneration is predominantly western hemlock and redcedar of poor vigour. The cover of undergrowth vascular species is sparse, and lichens are frequently abundant.

03 CwFd - Juniper - Falsebox Site Series occurs on sites similar to the /02 site series except that soils are derived from base-rich parent materials. The forest canopy is open and is usually dominated by Douglas-fir. The undergrowth has a low to moderate cover of soopolallie and common juniper (which distinguishes this site series from the /02), as well as a variety of forbs. The moss/lichen layer is dominated by red-stemmed feathermoss and *Dicranum* species, and generally contains few lichens.

04 HwCw - Step moss Site Series occurs on a wide range of predominantly submesic sites including subdued crests, thin soils, gentle slopes with dry sandy soils, and some steep slopes with dry, medium-textured soils. The forest canopy is dominated by western hemlock and often includes scattered Douglas-fir and redcedar. Lodgepole pine and Douglas-fir dominate seral stands. The undergrowth of mature stands is sparse except for a nearly continuous cover of mosses. The sparse vascular plant undergrowth and well-developed moss layer distinguishes this unit.

Wetter Sites Moist to wet forested sites are common on lower slopes, along watercourses, on fine-textured soils with intermittent seepage, and in local depressions. A well-developed undergrowth, usually with abundant thimbleberry, devil's club, ferns, several leafy forbs, and leafy mosses, distinguishes these from drier sites.

05 SxwCw - Oak fern Site Series occurs on moist lower and toe slope positions in valley bottoms, usually along streams and rivers. These sites accumulate cold air drainage and likely experience frequent growing-season frosts. The forest canopy and tree regeneration layer are typically dominated by hybrid white spruce and/or subalpine fir. Redcedar and western hemlock are scattered but generally restricted to the regeneration layer. Shrub cover is moderate and predominantly black huckleberry with some saskatoon, falsebox, and black twinberry. A moderate cover of herbs is dominated by low forbs such as rosy twistedstalk, twinflower, and oak fern. The lack of redcedar and hemlock in the mature forest canopy and the absence or very small cover of wet-site indicator species distinguishes this from other site series.

06 Sxw - Twinberry - Oak fern Site Series occurs on moist to wet (subhygric to hygric) lower and toe slope positions, usually along streams and rivers. These sites, which often occur below the /05 site series, accumulate cold air drainage and likely experience frequent growing-season frosts. The forest canopy and regeneration layer are most often dominated by subalpine fir and hybrid white spruce. Redcedar is mostly restricted to the lower canopy and regeneration layer. Shrub cover is greater than in the /05 site series and characterized by a high cover of black twinberry and/or thimbleberry. Devil's club is often scattered. The closely related /07 has more redcedar and hemlock in the overstory, and abundant devil's club in the undergrowth.

07 CwHw - Devil's club - Lady fern Site Series occurs on moist to wet, mid to toe slope positions, primarily on fluvial soils. Unlike the two preceding site series, the /07 generally has better air drainage and probably experiences less frequent summer frosts. The mature forest canopy is formed of large, widely spaced redcedar, hybrid white spruce, and western hemlock. The undergrowth is characterized by a dense cover of devil's club and ferns.

08 CwSxw - Skunk cabbage Site Series occurs on wet (hygric or subhydric) toe slope sites and depressions with a near-surface water table. Soils are organic or strongly gleyed mineral materials. The canopy is typically open and comprised of redcedar and hybrid white spruce with lesser amounts of western hemlock and subalpine fir. Tree regeneration occurs mostly on raised microsites. The undergrowth is characterized by a moderate cover of shrubs and a well-developed herb layer. Devil's club is less abundant than in the previous site series. Common forbs include skunk cabbage and horsetails, which distinguish this site series from others in the ICHwk2.

Non-forested Sites Non-forested wetlands, including fens and marshes, are common in the ICHwk2 and form extensive complexes on the floodplains of major rivers. They also occur along lakeshores and shallow ponds. Fens typically have scattered scrub birch, willows, sedges, cotton-grass. and golden fuzzy fen moss. Marshes usually include cattails, tall rushes, and sedges, as well as a variety of other hydrophytic vegetation. Bogs occur locally in small depressions. Other non-forested sites include shrub- and tall forb–dominated avalanche tracks, lichen-dominated talus slopes, and sparsely vegetated rock outcrops.

Key to Site Units of the IHwk2

1a. Soils shallow (<50 cm); exposed bedrock frequent; moisture regime xeric to subxeric; slope position crest or upper.

  2a. Soil parent materials derived from acidic rocks; western hemlock dominates mature stand; black huckleberry is principal shrub; common juniper and soopolallie usually absent.

    3a. Soils very shallow (<25 cm); lichens dominate moss/lichen layer; lodgepole pine common in mature forest canopy.
    ICHwk2/02 HwCw - Cladonia

3b. Soils deeper (25–50 cm); mosses dominate the moss/lichen layer, ground lichens not abundant; lodgepole pine seldom present in mature canopy.

ICHwk2/04 HwCw - Step moss

2b. Soil parent materials not derived from acidic rock types; western hemlock not dominant tree in mature canopy; common juniper and soopolallie are principal shrubs.

ICHwk2/03 CwFd - Juniper - Falsebox

1b. Soils deeper (>50 cm); exposed bedrock uncommon; moisture regime submesic or wetter; slope position not crest.

4a. Moisture regime submesic to subhygric; no persistent seepage within 1 m of soil surface; devil's club not abundant (up to 10% in /01b); sedges, sphagnum mosses, black twinberry (except in /05), and horsetails absent or incidental.

5a. Moisture regime mostly submesic; undergrowth sparse except for "carpet-like" cover of feathermosses; soils sandy or, if medium textured, then site on upper slope position.

ICHwk2/04 HwCw - Step moss

5b. Moisture regime mostly mesic or subhygric; vascular plant cover better developed; oak fern, foamflower, and rosy twistedstalk common.

6a. Mature forest canopy dominated by western hemlock and redcedar; devil's club often present but with low cover (<10%); black twinberry absent or incidental.

ICHwk2/01 CwHw - Oak fern;
/01a Typic Phase (mesic moisture regime)
/01b Moist Phase (subhygric moisture regime)

6b. Mature forest canopy dominated by hybrid white spruce and subalpine fir; black twinberry present; devil's club absent or incidental; cold air accumulation site.

ICHwk2/05 SxwCw - Oak fern

4b. Moisture regime subhygric to subhydric; persistent seepage or water table within 1 m of soil surface; devil's club, sedges, sphagnum moss, black twinberry, or horsetails abundant.

7a. Moisture regime subhygric; soils not organic or strongly gleyed (may be dull mottled in lower horizons); water table below 50 cm of soil surface by mid to late summer; soft-leaved sedge and horsetail species absent or incidental.

8a. Cover of black twinberry significantly greater than that of devil's club; mature forest canopy dominated by hybrid white spruce and subalpine fir; cold air accumulation sites.

ICHwk2/06 Sxw - Twinberry - Oak fern

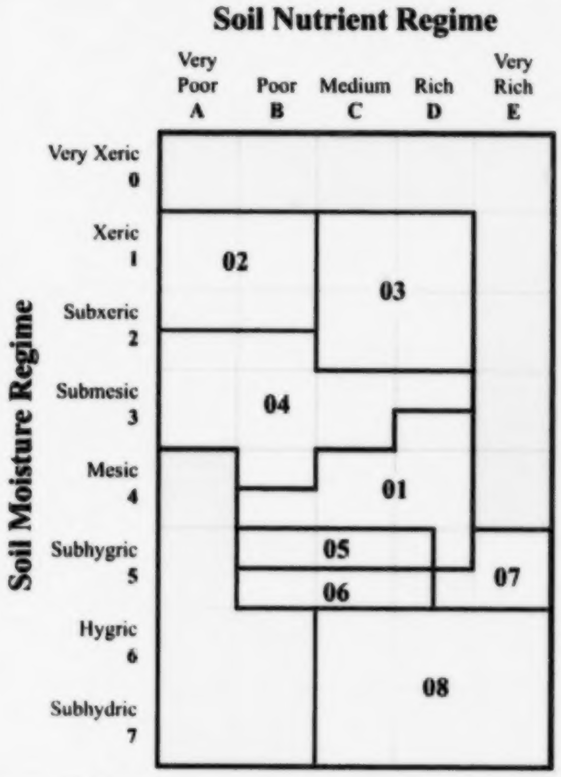
8b. Cover of devil's club significantly greater than that of black twinberry; canopy of mature forest dominated by hybrid white spruce and western redcedar.

ICHwk2/07 CwHw - Devil's club - Lady fern

7b. Moisture regime hygric or subhydric; soils organic or strongly gleyed; water table normally near soil surface (<50 cm) throughout the growing season; soft-leaved sedge and horsetails abundant.

ICHwk2/08 CwSxw - Skunk cabbage

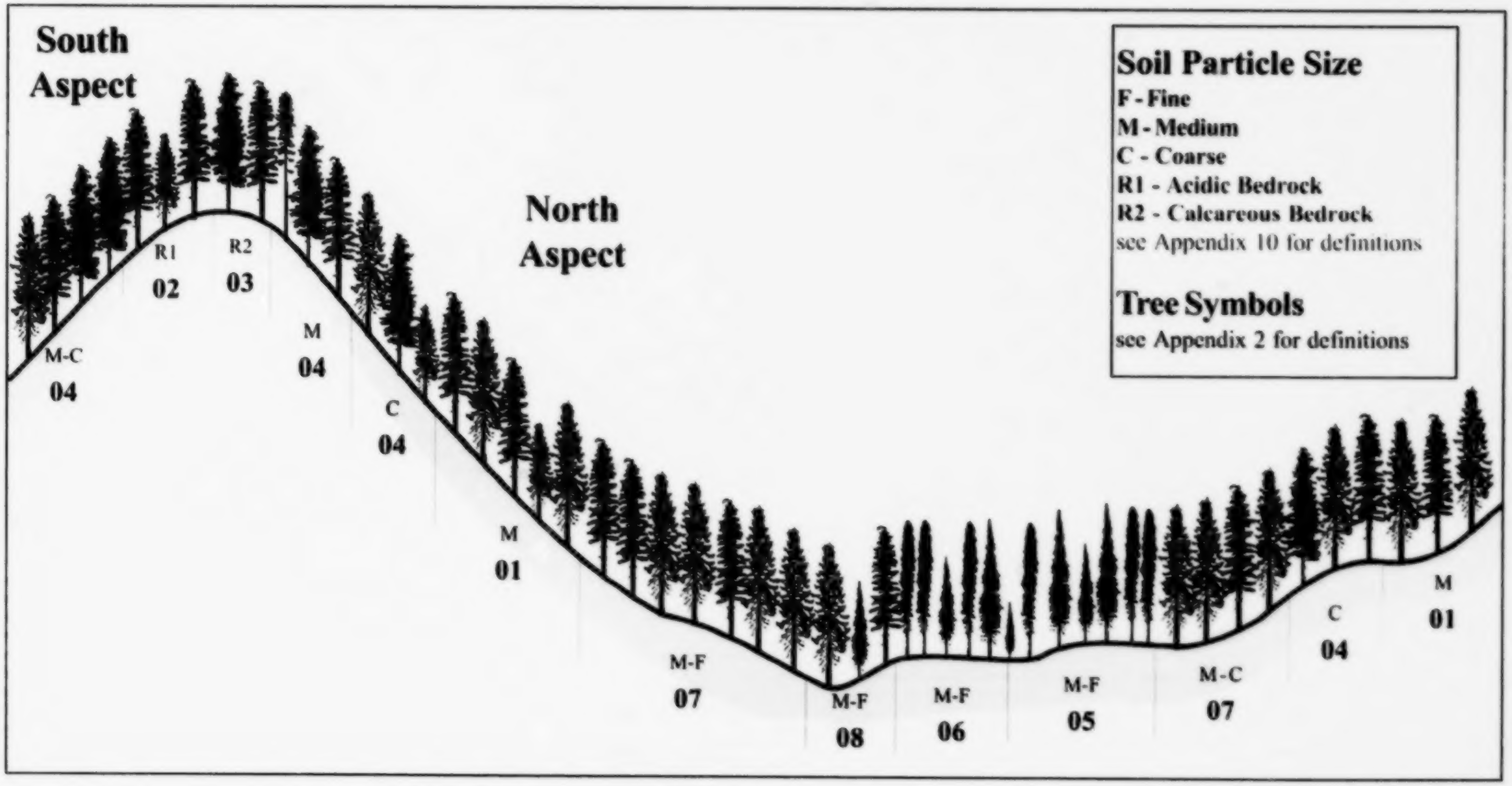
ICHwk2 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
01
05
06
07
08

Site Series

01	CwHw - Oak fern
02	HwCw - Cladonia
03	CwFd - Juniper - Falsebox
04	HwCw - Step moss
05	SxwCw - Oak fern
06	Sxw - Twinberry - Oak fern
07	CwHw - Devil's club - Lady fern
08	CwSxw - Skunk cabbage

ICHwk2 Landscape Profile


South
Aspect
North
Aspect
M-C
04
R1
02
R2
03
M
04
C
04
M
01
M-F
07
M-F
08
M-F
06
M-F
05
M-C
07
C
04
M
01
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R1 - Acidic Bedrock
R2 - Calcareous Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions

Site Features of ICHwk2 Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently to moderately sloping sites with mesic or submesic (/01a) or subhygric (/01b) moisture regime	hill crests, ridge tops and steep upper slopes with shallow (< 50 cm) soils derived from acidic rocks	hill crests, ridge tops and steep upper slopes with shallow (< 50 cm) soils derived from base-rich parent materials	wide range of submesic sites including low crests, shallow and sandy soils and steep slopes with loamy soils
Soil Moisture/ Nutrient Regimes	submesic - subhygric / poor - rich	xeric, subxeric / very poor - poor	xeric, subxeric / medium, rich	(subxeric) submesic, mesic / very poor - rich
Slope Position	mid (upper, lower)	crest, upper	crest, upper	mid, level (crest)
Aspect	all	all	all	all
Slope Grade (%)	usually < 30, occasionally to 80	< 20 on crests, up to 75 on upper slopes	< 20 on crests, up to 75 on upper slopes	generally < 35
Soil Texture	loamy, sandy	gravelly loamy	gravelly loamy	gravelly sandy and loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor, Mormoder 4 - 12	Xeromor, Hemimor 2 - 7	Xeromoder, Mormoder 1 - 6	Hemimor 4 - 15
Occurrence / Size / Distribution	common / medium - large / wide	uncommon / small / wide	uncommon / small / wide	common / small - medium / wide

Site Features of ICHwk2 Site Series (continued)

Site Series	05	06	07	08
Key Features	moist lower and toe slope sites with intermittent seepage and cold air accumulation; usually in valley bottoms	moist to wet, lower and toe slope sites with cold air accumulation; usually in valley bottoms along streams	moist, mid to toe slopes with intermittent to persistent seepage	wet toe slopes and depressions with near-surface (< 50 cm) water table
Soil Moisture/ Nutrient Regimes	subhygric / poor - rich	subhygric / poor - rich	subhygric / rich, very rich	hygric, subhydric / medium - very rich
Slope Position	lower, toe	lower, toe	mid - toe	depression (lower)
Aspect	all	all	all	N/A
Slope Grade(%)	< 15	< 10	0 - 35	< 10
Soil Texture	loamy	loamy, silty	(gravelly) loamy, sandy, silty	silty to sandy, organic
Humus Form and Thickness (cm)	Leptomoder, Mormoder 5 - 15	Leptomoder, Mormoder 5 - 15	Hemimor, Leptomoder, Mormoder 7 - 20	Hydromor, Hydromoder 15 - 90
Occurrence / Size / Distribution	locally common / small / mostly in McKusky and Horsefly river valleys	locally common / small - medium / mostly in McKusky and Horsefly river valleys	common / small - medium / wide	common / small / wide

ICHwk2 Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	
Tree Layer	*Pinus contorta*	█								lodgepole pine
	Pseudotsuga menziesii	█	█████	████						Douglas-fir
	Tsuga heterophylla	█		█████	█████			████	████	western hemlock
	Thuja plicata	███	█████	█████	█████	███	███	█████	█████	western redcedar
	Abies lasiocarpa					█████	████		████	subalpine fir
	Picea engelmannii x glauca			█		████	█████		████	hybrid white spruce
Shrub Layer	*Juniperus communis*		████							common juniper
	Shepherdia canadensis		████							soopolallie
	Pachistima myrsinites		████	███		███				falsebox
	Amelanchier alnifolia		███			███				saskatoon
	Vaccinium membranaceum	████	███	███	███	█████			███	black huckleberry
	Acer glabrum		███					███		Douglas maple
	Vaccinium ovalifolium				███	███		█	███	oval-leaved blueberry
	Oplopanax horridus				███		████	█████	████	devil's club
	Rubus parviflorus					███	█████	███	█	thimbleberry
	Lonicera involucrata					███	█████		███	black twinberry
Herb Layer	*Chimaphila umbellata*	███	███	███	█					prince's pine
	Linnaea borealis	███	████	███	█	████			███	twinflower
	Arctostaphylos uva-ursi		███							kinnikinnick
	Orthilia secunda		██	███	███				██	one-sided wintergreen
	Clintonia uniflora			███	████	███		███		queen's cup
	Rubus pedatus			███	███	████	███	███	███	five-leaved bramble
	Cornus canadensis			███	████	███		███	████	bunchberry
	Gymnocarpium dryopteris				████	███	█████	█████	████	oak fern
	Streptopus roseus				███	█████	█████	███	███	rosy twistedstalk
	Dryopteris expansa				███		█████	████		spiny wood fern
	Athyrium filix-femina						█████	█████	███	lady fern
	Galium triflorum						███	███	███	sweet-scented bedstraw
	Streptopus amplexifolius						████	███	███	clasping twistedstalk
	Actaea rubra							███		baneberry
	Equisetum arvense								████	common horsetail
	Lysichitum americanum								████	skunk cabbage
Moss Layer	*Racomitrium canescens*	████								grey frayed-cap moss
	Cladonia spp.	████	██							cladonia lichens
	Peltigera aphthosa	███	███	███						freckle pelt
	Pleurozium schreberi	█████	███	█████	█████	█████	██	█	███	red-stemmed feathermoss
	Ptilium crista-castrensis			████	████	█████	███	███	███	knight's plume
	Hylocomium splendens			█████	█████	███		████	████	step moss
	Rhytidiadelphus triquetrus		███	█	█	███	███	███	█████	electrified cat's-tail moss
	Mnium spp.		██	█	███	███	█████	█████	█████	leafy mosses

[a] Species abundance: █ present in 40–60% of plots surveyed; ██ >60% of plots, mean cover <1%; ███ >60% of plots, mean cover 1–7%; ████ >60% of plots, mean cover >7–15%; █████ >60% of plots, mean cover >15%

ICHwk4
INTERIOR CEDAR–HEMLOCK
WET COOL SUBZONE
CARIBOO VARIANT

The ICHwk4 occurs in the wet northeastern part of the Cariboo Forest Region in the valleys of the Cariboo and Matthew rivers. It also occurs around Lanezi and Isaac lakes in Bowron Lake Provincial Park and in the southeastern part of the Prince George Forest Region. Elevations of the ICHwk4 are generally 800–1250 m.

Distinguishing Adjacent Units from the ICHwk4

The **ICHwk2** replaces the ICHwk4 at similar elevations around Quesnel and Horsefly lakes and along the Horsefly and Crooked rivers. To the west and north it is replaced by the colder climate of the **SBSwk1**. At the southwest corner of Bowron Lakes Provincial Park the ICHwk4 adjoins a small outlier of **ICHmk3**. The **ESSFwk1** occurs at elevations above the ICHwk4.

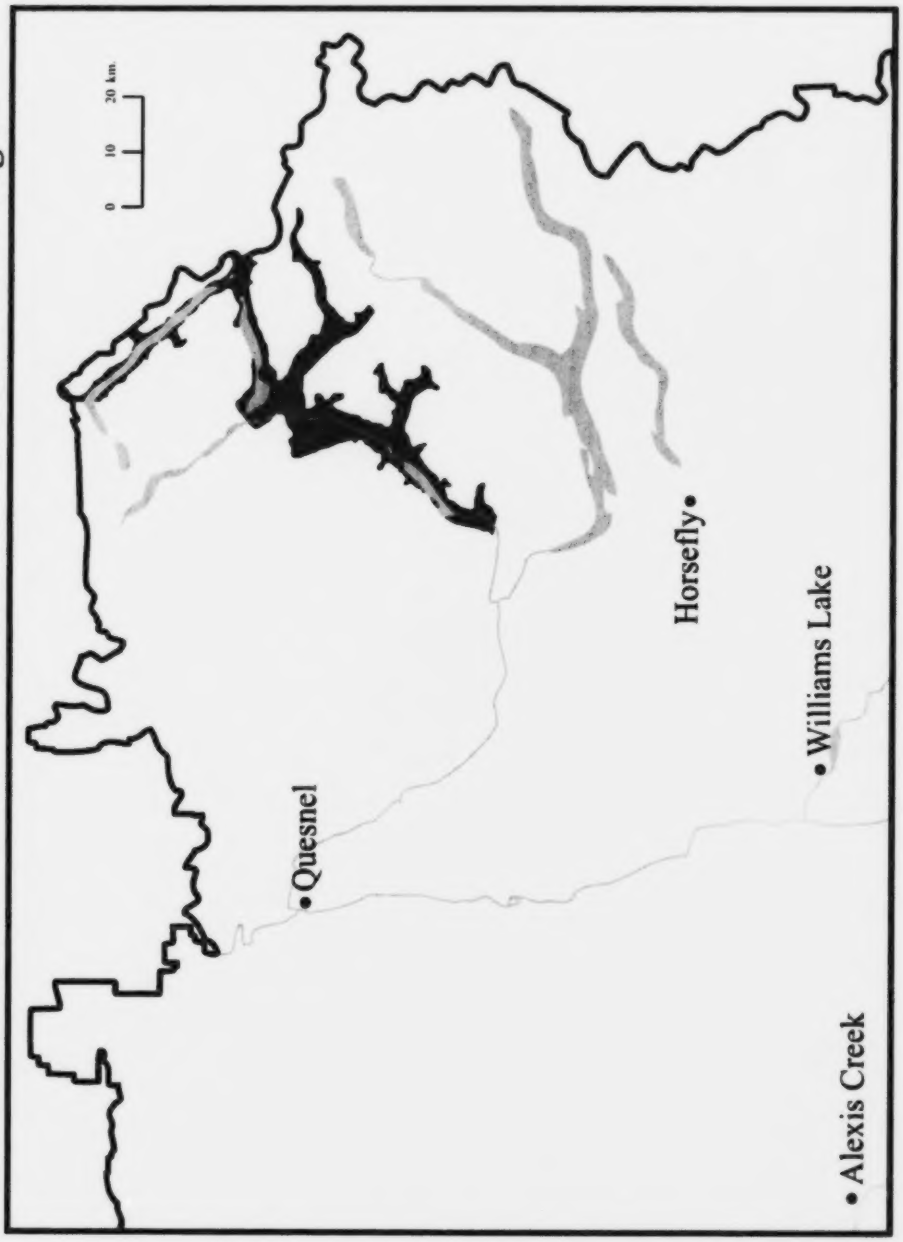
In the **ICHwk2**, zonal sites have:
- western yew;
- more frequent redcedar and hemlock;
- less subalpine fir and hybrid white spruce.

wet sites have:
- skunk cabbage.

In the **ICHmk3**, zonal sites have:
- no western hemlock.

In the **SBSwk1**, zonal sites have:
- dominant subalpine fir and hybrid white spruce;
- step moss often dominating moss layer;
- no redcedar or western hemlock.

In the **ESSFwk1**, zonal sites have:
- Engelmann spruce;
- white-flowered rhododendron, Sitka valerian, and Indian hellebore;
- no redcedar or western hemlock.



0
10
20 km.
Quesnel
Horsefly
Williams Lake
Alexis Creek

Distribution of ICHwk4 Variant in the Cariboo Forest Region

Site Units of the ICHwk4

Zonal Site Series **01 CwHw - Oak fern Site Series** is the most extensive site unit in the ICHwk4. It occurs primarily on sites with mesic moisture regime and medium-textured soils or occasionally coarser-textured soils where intermittent seepage is present (/01a Typic Phase), and less commonly on sites with subhygric moisture regime and frequently silty and clayey soils (/01b Moist Phase). Western redcedar and western hemlock are principal canopy species but, unlike in the ICHwk2, subalpine fir and hybrid white spruce trees are very common in mature stands. Seral stands are typically dominated by lodgepole pine or Douglas-fir, with the latter often persisting into late seral stages due to its long life. In mature stands, all four canopy tree species are represented in the regeneration layer. Shrub cover is relatively sparse and dominated by black huckleberry and oval-leaved blueberry, with occasional thimbleberry and black twinberry as moisture increases. Oak fern and leafy low forbs form a nearly continuous cover, and boreal feathermosses form a deep, carpet-like layer.

Drier Sites Sites drier than zonal occur on crest and steep upper slopes with shallow soils and on gentle slopes with sandy soils. These sites have less redcedar and a more sparse cover of forbs than the zonal sites. The undergrowth is similar to that of dry sites in the ICHwk2, except that a dry, sandy, terrace ecosystem with abundant velvet-leaved blueberry is present.

02 HwCw - Cladonia Site Series occurs on hill crests and steep upper slopes with thin, often gravelly soils derived from acidic rocks. Bedrock is frequently exposed and tree productivity is poor. The mature forest canopy is open and dominated by hemlock, while seral stands are usually dominated by lodgepole pine. Tree regeneration is western hemlock and redcedar, generally with poor vigour. The shrub and herb layers are relatively sparse, containing mostly black huckleberry and a few low forbs. Velvet-leaved blueberry may be present. Lichens are typically abundant.

03 CwSxw - Soopolallie Site Series occurs on sites similar to the /02 site series but has soil parent materials derived from base-rich rocks. The forest canopy is open and is usually dominated by Douglas-fir, often with scattered western hemlock and lodgepole pine. The undergrowth consists of a low to moderate cover of shrubs (soopolallie, falsebox, common juniper) as well as a few low forbs. Soopolallie and common juniper distinguish these sites from those of the /02 series.

04 CwSxw - Velvet-leaved blueberry Site Series is most common on sandy fluvial terraces in the Matthew and Cariboo river drainages. These essentially level valley-bottom sites are prone to summer frosts. Subalpine fir and hybrid white spruce typically dominate the canopy and tree regeneration of mature stands. Younger stands are most often dominated by lodgepole pine. Velvet-leaved blueberry and black huckleberry are abundant, with the former distinguishing these sites from the /05 site series.

05 HwCw - Step moss Site Series occurs on gentle to moderate gradient dry slopes with sandy soils, and on steep dry slopes with loamy soils. The mature forest canopy is typically dominated by western hemlock with scattered Douglas-fir and redcedar. Lodgepole pine and Douglas-fir dominate seral stands. The cover of shrubs and herbs is generally sparse but a nearly continuous cover of boreal feathermosses is present. The sparse cover of shrubs and herbs, and the dense moss layer, distinguishes this site series.

Wetter Sites Forested sites wetter than zonal are common on lower and toe slope positions, mid slope seepage areas, sites along streams and lakes, on fine-textured soils with intermittent seepage, and in local depressions. A vigorous undergrowth, usually with an abundant cover of thimbleberry, devil's club, ferns, leafy forbs, and leafy mosses, distinguishes these sites from zonal and drier sites.

06 Sxw - Twinberry - Oak fern Site Series occurs on moist lower and toe slope positions in valley bottoms, usually along streams and rivers. These sites accumulate cold air drainage and likely experience frequent growing-season frosts. The forest canopy is typically dominated by subalpine fir and hybrid white spruce. Redcedar, although usually present, is mostly restricted to the lower canopy and regeneration layer. Compared to drier sites, the undergrowth is well developed, often with a high cover of black twinberry, thimbleberry, leafy forbs, and oak fern. Devil's club is often present with low cover. Leafy mosses and *Brachythecium* species form a moderate cover in the moss layer. A dense cover of black twinberry and thimbleberry separates this site series from the /07 site series and from drier sites.

07 CwHw - Devil's club - Lady fern Site Series occurs on moist mid to toe slope positions. Since it is most often on slopes, this site series experiences less frequent growing-season frosts than does the /06 site series. The forest canopy consists predominantly of large, widely spaced hybrid white spruce, redcedar, western hemlock, and subalpine fir. The vigorous undergrowth is dominated by a high cover of devil's club and ferns. The moss layer is only moderately to poorly developed. The high cover of devil's club distinguishes this site series from the /06.

08 Sxw - Devil's club - Lady fern Site Series occurs on wet toe slope positions and depressions that have a water table within 50 cm of the soil surface for most of the growing season. Tree and shrub growth is limited by cold, wet soils that are organic or strongly gleyed. The mature forest canopy is dominated by relatively open-grown hybrid white spruce and subalpine fir. Tree regeneration occurs primarily on raised microsites. Total shrub cover is low to moderate and consists of several species. Devil's club is less abundant than in the previous site series. The herb layer is well developed and dominated by horsetails, a variety of leafy forbs, and lady fern. Feathermosses dominate hummocks while leafy mosses and liverworts occur in micro-depressions, often with standing water. This site series is distinguished from all others of the ICHwk4 by abundant horsetails and soft-leaved sedge.

Non-forested Sites Non-forested wetlands occur primarily in valley bottoms. In some larger valleys, such as the Cariboo River valley, they form extensive complexes of many wetland types. Fens and shrub swamps are the most common types. Fens typically have scrub birch, willows, sedges, cotton-grass, and golden fuzzy fen moss. Swamps are common on floodplains and are dominated by a tangle of willows and alder. Bogs occur locally in small depressions, especially where acidic parent materials are common. They often have stunted lodgepole pine and hybrid white spruce as well as Labrador tea, scrub birch, and abundant sphagnum moss. Other non-forested sites include shrub- and tall forb–dominated avalanche tracks, lichen-dominated talus slopes, and lichen- and moss-covered rock outcrops.

Key to Site Units of the ICHwk4

1a. Soils shallow, bedrock within 50 cm of soil surface, bedrock outcrops common; moisture regime xeric to subxeric; crest and upper slope positions.

  2a. Soils derived from acidic rock types; lichens and grey frayed-cap moss common; soopolallie, common juniper, and wild strawberry absent or incidental.
  ICHwk4/02 HwCw - Cladonia

  2b. Soils derived from base-rich rock types (basalt, limestone, etc.); soopolallie, common juniper, and wild strawberry usually present; lichens less abundant and grey frayed-cap moss absent.
  ICHwk4/03 CwSxw - Soopolallie

1b. Soils deeper (>50 cm); bedrock outcrops usually absent; moisture regime subxeric or wetter; slope position variable.

  3a. Moisture regime subxeric or submesic; foamflower, rosy twistedstalk, and oak fern absent or very sparse (except in 6b below—ICHwk4/01).

    4a. Soils sandy (loamy sand or sand); parent materials usually fluvial.

      5a. Level valley-bottom sites; shrub and herb layer cover moderate; rough-leaved ricegrass and velvet-leaved blueberry present.
      ICHwk4/04 CwSxw - Velvet-leaved blueberry

      5b. Level sites on valley sides (i.e., kame terraces) or sloping mid to upper slope positions; shrub and herb layers sparse; rough-leaved ricegrass and velvet-leaved blueberry absent; feathermoss cover nearly continuous.
      ICHwk4/05 HwCw - Step moss

    4b. Soils not sand or loamy sand; soil parent materials various.

      6a. Soils loamy; shrub and herb layers sparse; feathermoss cover nearly continuous; rosy twistedstalk, oak fern, and foamflower absent or incidental.
      ICHwk4/05 HwCw - Step moss

6b. Soils silty or clayey (usually fluvial materials); shrub and herb layers well developed; rosy twistedstalk, oak fern, and foamflower present.

ICHwk4/01 CwHw - Oak fern;
/01a Typic Phase

3b. Moisture regime mesic or wetter; foamflower, rosy twistedstalk, oak fern, or horsetail present.

7a. Moisture regime mesic or subhygric; seepage or water table usually not present within 1 m of soil surface; soils not gleyed and seldom mottled.

ICHwk4/01 CwHw - Oak fern;
/01a Typic Phase (mesic; oak fern cover <15 %)
/01b Moist Phase (subhygric; oak fern cover >15%)

7b. Moisture regime subhygric to subhydric; seepage water or water table within 1 m of surface until at least mid summer; soils usually organic, strongly mottled, or gleyed.

8a. Moisture regime subhygric; soft-leaved sedge and horsetails absent or incidental; devil's club sparse to abundant.

9a. Black twinberry or thimbleberry cover greater than devil's club cover in mature stands; lower or toe slope position; usually in valley bottoms with significant cold air accumulation.

ICHwk4/06 Sxw - Twinberry - Oak fern

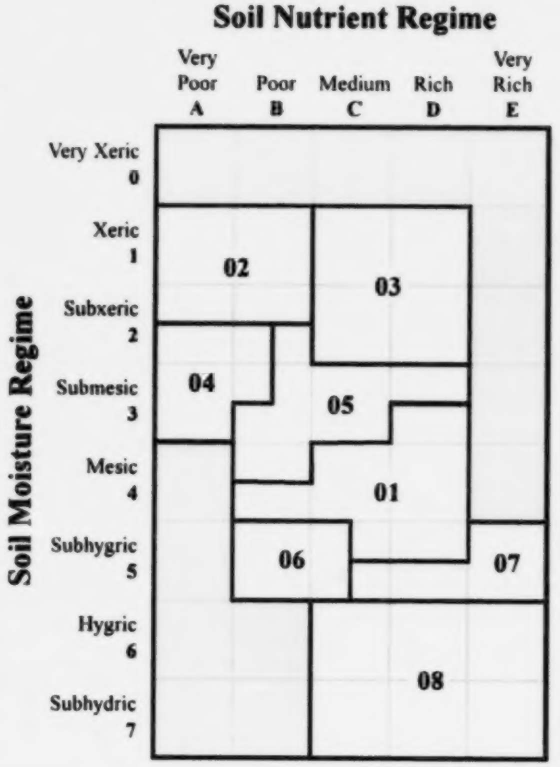
9b. Devil's club cover 20–40 % and greater than that of black twinberry or thimbleberry in mature stands; slope position middle to toe or level.

ICHwk4/07 CwHw - Devil's club - Lady fern

8b. Moisture regime hygric or subhydric; soft-leaved sedge and horsetail present and often abundant; devil's club cover sparse if present.

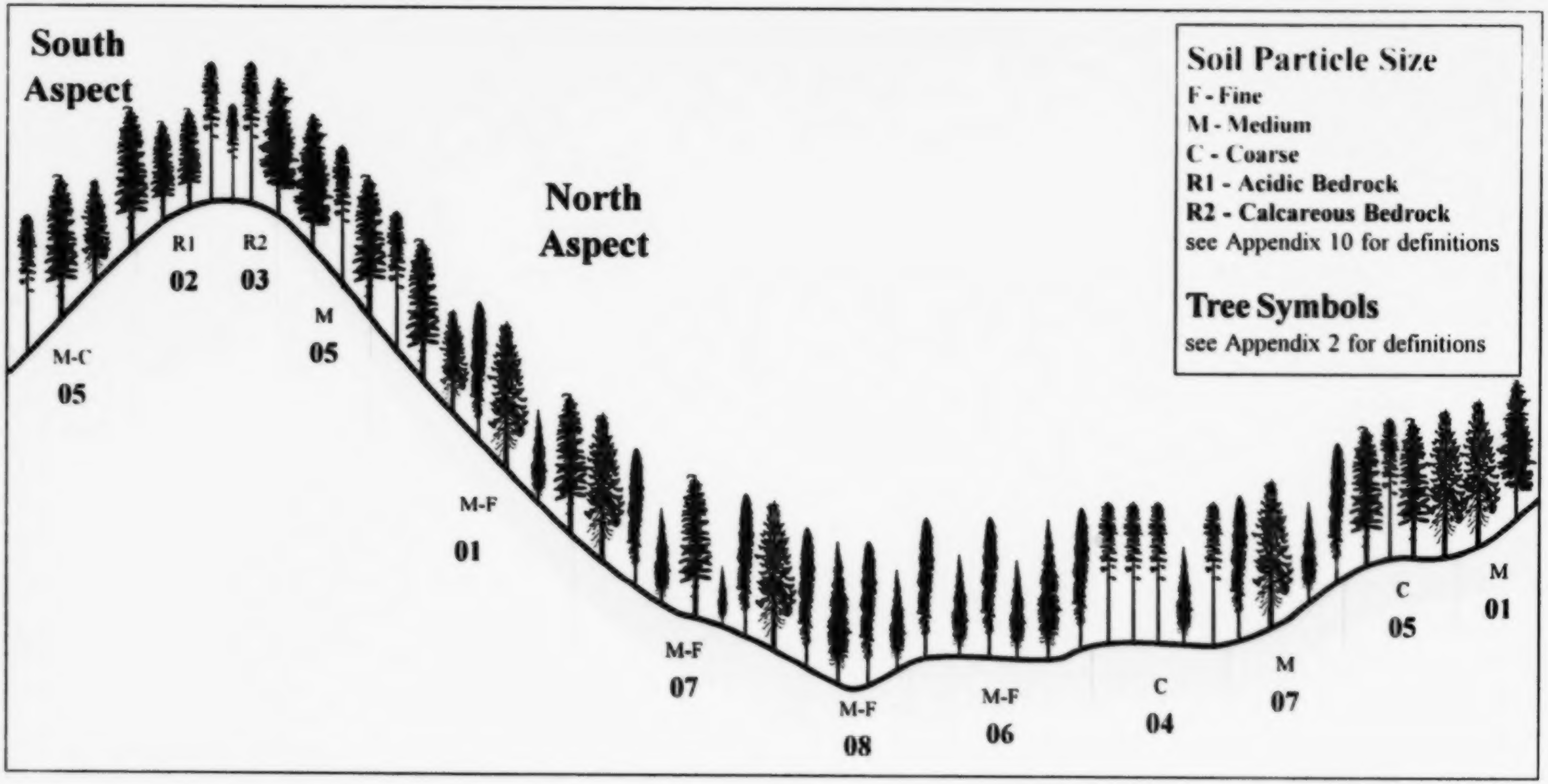
ICHwk4/08 Sxw - Devil's club - Lady fern

ICHwk4 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
01
02
03
04
05
06
07
08

Site Series	
01	CwHw - Oak fern
02	HwCw - Cladonia
03	CwSxw - Soopolallie
04	CwSxw - Velvet-leaved blueberry
05	HwCw - Step moss
06	Sxw - Twinberry - Oak fern
07	CwHw - Devil's club - Lady fern
08	Sxw - Devil's club - Lady fern

ICHwk4 Landscape Profile


South Aspect
M-C
05
R1
02
R2
03
M
05
North Aspect
M-F
01
M-F
07
M-F
08
M-F
06
C
04
M
07
C
05
M
01
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R1 - Acidic Bedrock
R2 - Calcareous Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions

Site Features of ICHwk4 Site Series

Site Series	01	02	03
Key Features	zonal and other gentle to moderately sloping sites with mesic or submesic (/01a) and subhygric (/01b) moisture regime	hill crests, ridge tops and steep upper slopes with thin (< 50 cm) soils derived from acidic parent materials	hill crests, ridge tops and steep upper slop with thin (< 50 cm) soils derived from ba rich parent materials
Soil Moisture / Nutrient Regimes	submesic - subhygric / poor - rich	xeric, subxeric / very poor, poor	xeric, subxeric / medium, rich
Slope Position	mid (upper - lower)	crest, upper	crest, upper
Aspect	all	all	all
Slope Grade (%)	usually < 35, occasionally to 70	< 20 on crests, < 75 on upper slopes	< 20 on crests, < 75 upper slopes
Soil Texture	loamy to clayey	gravelly loamy	gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 10	Xeromor, Hemimor 2 - 7	Xeromoder, Mormoder 1 - 6
Occurrence / Size / Distribution	common / small - large / wide	uncommon / small / wide	uncommon / small / wide

Site Features of ICHwk4 Site Series (contin

Site Series	05	06	07
Key Features	1) dry, gently sloping sites with sandy soils and 2) steeply sloping sites with loamy soils	moist, lower and toe slope sites with cold air accumulation; usually valley bottoms	moist, mid to toe s positions with intermittent to per seepage
Soil Moisture/ Nutrient Regimes	(subxeric) submesic, mesic / poor - rich	subhygric / poor, medium	subhygric / medium - very ric
Slope Position	upper, mid, level (crest)	lower, toe	mid - toe
Aspect	all	all	all
Slope Grade (%)	0 - 80	mostly < 15	5 - 60
Soil Texture	gravelly sandy, loamy	silty, loamy, sandy	(gravelly) loamy, sandy, silty
Humus Form and Thickness (cm)	Hemimor 3 - 10	Leptomoder, Mormoder 3 - 15	Hemimor, Leptom Mormoder 3 - 40
Occurrence / Size / Distribution	common / small - medium / wide	locally common / small - medium / wide	common / small - medium / wide

ICHwk4 Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	
Tree Layer	*Pinus contorta*	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮					lodgepole pine
	Pseudotsuga menziesii		▮▮▮		▮					Douglas-fir
	Abies lasiocarpa			▮▮▮▮	▮	▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮	subalpine fir
	Tsuga heterophylla	▮▮▮			▮▮▮▮▮	▮▮▮▮▮	▮	▮		western hemlock
	Thuja plicata				▮	▮▮▮▮		▮▮▮▮▮		western redcedar
	Picea engelmannii x *glauca*		▮▮▮▮			▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	hybrid white spruce
Shrub Layer	*Pachistima myrsinites*	▮▮▮	▮▮▮▮		▮▮▮					falsebox
	Vaccinium myrtilloides	▮▮▮▮▮		▮▮▮▮						velvet-leaved blueberry
	Vaccinium membranaceum	▮▮▮▮	▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮▮▮	black huckleberry
	Amelanchier alnifolia		▮▮▮	▮▮▮			▮			saskatoon
	Juniperus communis		▮▮▮							common juniper
	Shepherdia canadensis		▮▮▮▮							soopolallie
	Ribes lacustre		▮▮▮			▮	▮▮▮	▮▮▮	▮▮▮▮	black gooseberry
	Vaccinium ovalifolium			▮▮		▮▮▮	▮	▮▮▮	▮▮▮	oval-leaved blueberry
	Lonicera involucrata			▮▮▮			▮▮▮▮	▮	▮▮▮	black twinberry
	Oplopanax horridus					▮	▮	▮▮▮▮▮	▮▮▮	devil's club
Herb Layer	*Linnaea borealis*	▮▮		▮▮▮	▮▮▮					twinflower
	Orthilia secunda		▮▮▮		▮	▮▮▮				one-sided wintergreen
	Chimaphila umbellata	▮▮	▮▮		▮					prince's pine
	Cornus canadensis	▮▮▮		▮▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	bunchberry
	Rubus pedatus	▮▮		▮▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	five-leaved bramble
	Lycopodium annotinum			▮▮▮		▮	▮▮▮		▮▮▮	stiff clubmoss
	Aralia nudicaulis			▮▮▮			▮	▮		wild sarsaparilla
	Clintonia uniflora				▮	▮▮▮		▮▮▮		queen's cup
	Streptopus roseus				▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	rosy twistedstalk
	Gymnocarpium dryopteris					▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	oak fern
	Tiarella trifoliata					▮▮▮	▮▮▮	▮▮▮	▮▮▮	foamflower
	Streptopus amplexifolius					▮	▮▮▮	▮▮▮	▮▮▮	clasping twistedstalk
	Smilacina racemosa					▮▮	▮▮▮	▮		false Solomon's-seal
	Equisetum arvense						▮▮▮		▮▮▮▮▮	common horsetail
	Athyrium filix-femina					▮	▮	▮▮▮	▮▮▮▮▮	lady fern
Moss Layer	*Cladonia / Cladina* spp.	▮▮▮	▮▮							cladonia lichens / reindeer lichens
	Dicranum fuscescens		▮▮▮▮		▮					curly heron's-bill moss
	Polytrichum juniperinum		▮▮▮							juniper haircap moss
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮		▮▮▮	red-stemmed feathermoss
	Hylocomium splendens		▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮	▮▮▮	step moss
	Ptilium crista-castrensis		▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	knight's plume
	Rhytidiadelphus triquetrus					▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	electrified cat's-tail moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%. ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

IDFdk1
INTERIOR DOUGLAS-FIR
DRY COOL SUBZONE
THOMPSON VARIANT

The IDFdk1 occurs primarily on the Thompson Plateau in the Kamloops Forest Region. It has a very minor area (approximately 20 km^2) within the Cariboo Forest Region, southeast of Hihium Lake. In this area it occurs on plateau landscapes above the incised Deadman River valley, from approximately 1100 to 1300 m elevation.

Distinguishing Adjacent Units from the IDFdk1

The **IDFdk3** occurs primarily on the Fraser Plateau and replaces the IDFdk1 north of Tobacco Creek. The **MSxk** occurs at higher elevations (>1350 m) in the Hihium Lake area, while the **IDFxw** occurs at lower elevations in the Deadman River valley.

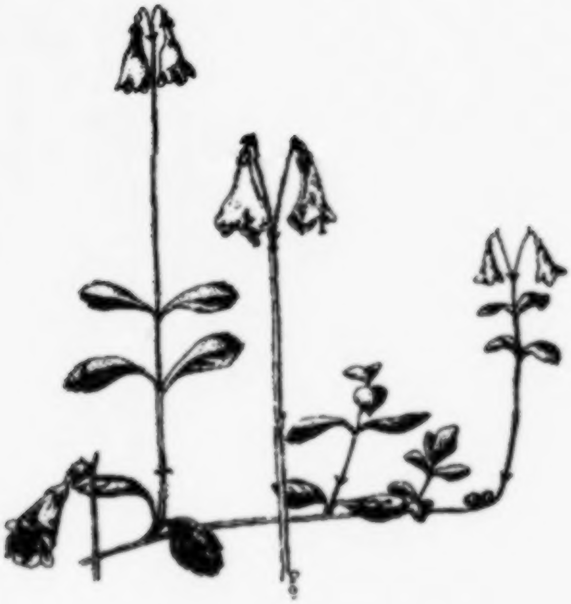
In the **IDFdk3**, zonal sites have:
- only minor differences with the IDFdk1;
- dwarf blueberry;
- often more abundant kinnikinnick;
- typically more Douglas-fir regeneration in mature stands.

In the **MSxk**, zonal sites have:
- little or no Douglas-fir;
- hybrid white spruce regeneration;
- grouseberry, black huckleberry, and bunchberry.

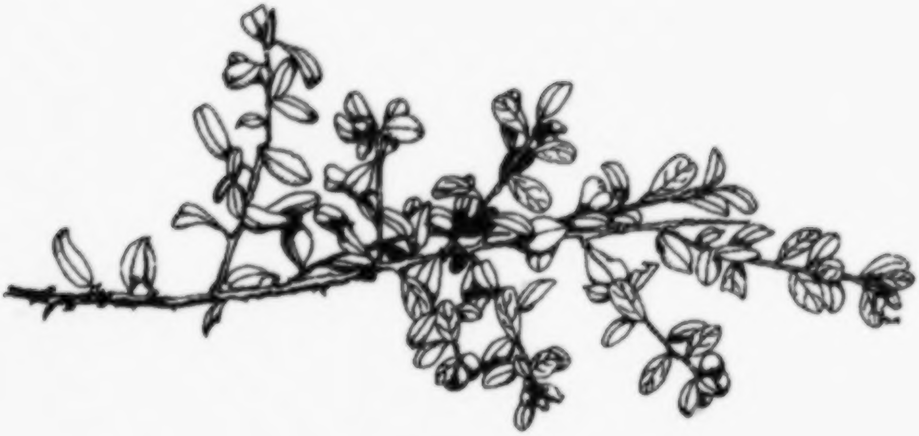
In the **IDFxw**, zonal sites have:
- no lodgepole pine or twinflower;
- ponderosa pine and bluebunch wheatgrass.

Site Units of the IDFdk1

A site classification has been developed for the IDFdk1 in the Kamloops Forest Region (Lloyd *et al.* 1990) and is expected to apply to the IDFdk1 in the Cariboo Forest Region. Refer to Lloyd *et al.* (1990) for a description of site units.



Twinflower
Linnaea borealis



Kinnikinnick
Arctostaphylos uva-ursi

IDFdk3
INTERIOR DOUGLAS-FIR
DRY COOL SUBZONE
FRASER VARIANT

The IDFdk3 occurs on level to gently rolling landscapes of the Fraser Plateau east of the Fraser River and north to about Alexandria. North of the Chilcotin River, it also occurs on the west side of the Fraser River. Elevations range from about 750 to 1200 m.

Distinguishing Adjacent Units from the IDFdk3

The **IDFxm** occurs in the valleys of the Fraser and Chilcotin rivers at elevations below the IDFdk3. The **SBSdw2** occurs east of the IDFdk3, in the wetter portions of the Fraser Plateau. The **SBPSmk** also occurs east of the IDFdk3 but on level to undulating terrain with poor cold air drainage. West of the IDFdk3, where climates are drier, the **IDFdk4** occurs at elevations similar to the IDFdk3, while the **SBPSxc** and **SBPSdc** occur at higher elevations, above about 1200 m. The SBPSxc occurs in drier climates than the SBPSdc. At the southern limits of the IDFdk3, the **MSxk** occurs at elevations above, and the **IDFxw** at elevations below, the IDFdk3.

In the **IDFxm**, zonal sites have:
- bluebunch wheatgrass, spreading needlegrass, or lemonweed;
- no lodgepole pine (except in some plateau grassland-forest parklands near the IDFdk3 boundary) or twinflower.

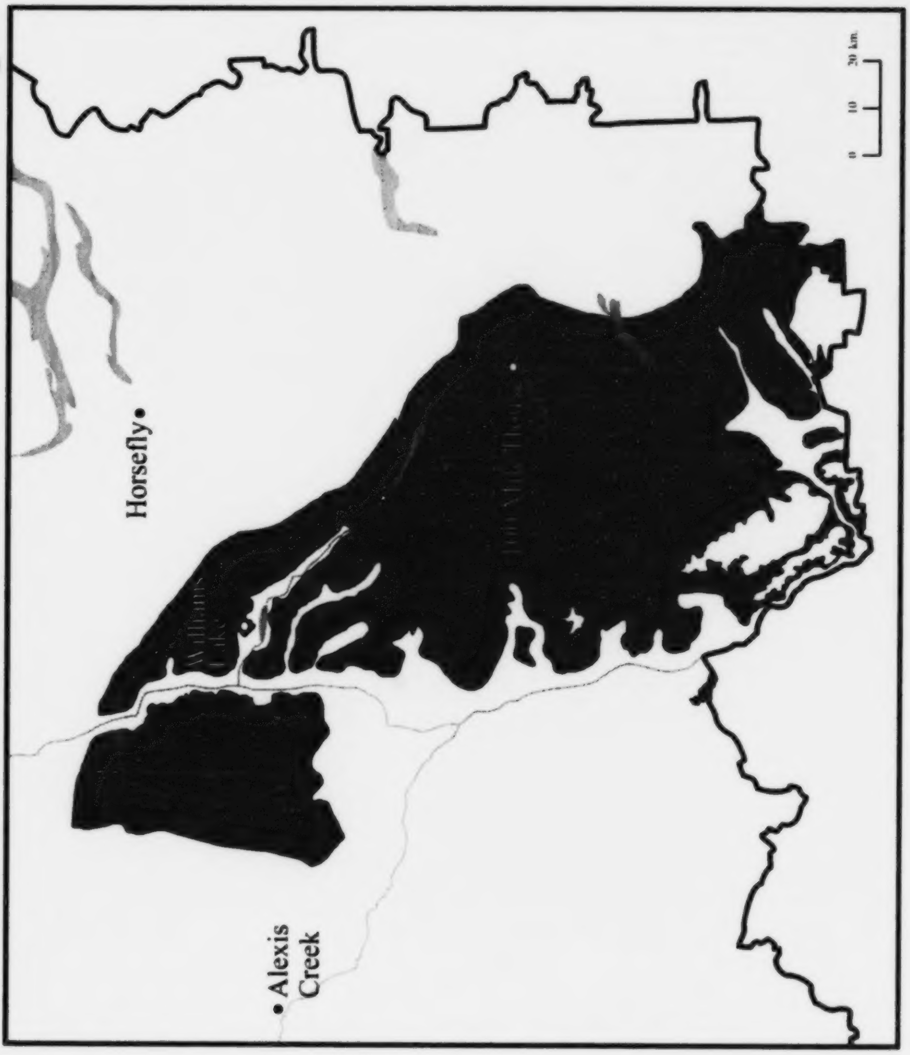
In the **IDFxw**, zonal sites have:
- ponderosa pine and bluebunch wheatgrass;
- no lodgepole pine or twinflower.

In the **IDFdk1**, zonal sites have:
- only minor differences;
- no dwarf blueberry.

In the **IDFdk4**, zonal sites have:
- greater cover of kinnikinnick than twinflower;
- greater cover of lichens than feathermosses.

In the **SBSdw2**, zonal sites have:
- hybrid white spruce and occasionally subalpine fir;
- bunchberry, black huckleberry, and thimbleberry.

Distribution of IDFdk3 Variant in the Cariboo Forest Region


Horsefly
Williams Lake
100 Mile House
Alexis Creek
0
10
20 km

In the **SBPSxc**, zonal sites have:
- bunchberry and 10% or greater cover of kinnikinnick;
- no Douglas-fir;
- little or no timber milk-vetch.

In the **SBPSdc**, zonal sites have:
- bunchberry and 10% or greater cover of kinnikinnick;
- no Douglas-fir;
- little or no timber milk-vetch.

In the **SBPSmk**, zonal sites have:
- bunchberry or black huckleberry;
- spruce or lodgepole pine climax;
- no timber milk-vetch.

moist sites often have:
- subalpine fir regeneration.

In the **MSxk**, zonal sites have:
- black huckleberry, bunchberry, and grouseberry;
- hybrid white spruce regeneration.

Site Units of the IDFdk3

Zonal Site Series **01 FdPl - Pinegrass - Feathermoss Site Series** dominates the IDFdk3, occupying approximately 85–90% of the landscape. These sites are generally level to gently sloping, and vegetated by Douglas-fir (climax) or lodgepole pine (seral) forests. Small trembling aspen stands occur locally. The Douglas-fir stands are typically multi-aged and multi-storied with abundant, usually patchy Douglas-fir regeneration. Pine stands are typically uniform-aged with little pine regeneration but sparse to dense Douglas-fir regeneration. The undergrowth vegetation of both forests is dominated by pinegrass and mosses, especially red-stemmed feathermoss. Only scattered shrubs are present. The proportion of pine stands on the landscape generally increases at higher elevations and in the relatively dry southern portions of the IDFdk3.

Drier Sites Sites drier than zonal sites occur primarily on steep slopes and on local ridge crests and bedrock outcrops. They account for a small proportion of the landscape. Moss cover is less than on the zonal sites, and several dry land vascular plants such as bluebunch wheatgrass, common juniper, and kinnikinnick are abundant. Pinegrass is less abundant than on zonal sites.

02 Fd - Juniper - Kinnikinnick Site Series occurs on moderately steep south- or west-facing slopes with sandy soils. It is uncommon but distributed throughout the IDFdk3. It typically has a very open canopy with multi-sized Douglas-fir and usually several large snags. Stunted aspen occur on some sites. Tree regeneration is sparse and occurs primarily in shaded areas but not directly under larger Douglas-fir trees. The undergrowth is sparse and dominated by kinnikinnick. It includes little moss or lichen cover. Exposed mineral soil is common.

03 Fd - Juniper - Peltigera Site Series occurs on upper and crest slope positions with very thin (<25 cm) soils. Bedrock is commonly exposed but pockets of deeper soil are also present. These ecosystems are typically very small, but are distributed throughout the IDFdk3. Small Douglas-fir and lodgepole pine typically dominate the canopy, which is open or closed depending on the area of exposed bedrock. The undergrowth is sparse and dominated by common juniper, dry-land forbs and grasses, and lichens. Pinegrass cover is sparse.

04 Fd - Bluebunch Wheatgrass - Needlegrass Site Series occurs on very steep (>45%) south- and west-facing slopes with loamy soils. These hot, dry ecosystems are uncommon. The forest canopy is open and dominated by multi-sized Douglas-fir, often with several large snags. Douglas-fir regeneration is sparse and occurs primarily in shaded areas but not directly beneath the canopy of large trees. Stunted aspen are common. The undergrowth includes a moderate cover of common juniper, bluebunch wheatgrass, and spreading needlegrass. Moss cover is sparse. Abundant bluebunch wheatgrass and sparse pinegrass distinguishes these from other IDFdk3 sites.

05 Fd - Feathermoss - Step moss Site Series occurs on moderate to very steep (>20%) north-facing slopes with either sandy or loamy soils. These sites are moderately common but generally small, occurring on short slopes. The forest canopy is relatively closed, and dominated by Douglas-fir and a few lodgepole pine. Douglas-fir regeneration is often dense. The undergrowth is dominated by mosses (primarily step moss and red-stemmed feathermoss) and typically has few vascular plants other than scattered pinegrass, showy aster, and twinflower. Shrubs are scarce. The strong dominance of the undergrowth by mosses distinguishes this site series from others of the IDFdk3.

06 Fd - Pinegrass - Aster Site Series occurs on moderately steep (15–45%) south-facing slopes with deep loamy soils. The mature forest canopy is dominated by multi-sized Douglas-fir trees with relatively little lodgepole pine. Large Douglas-fir trees and snags are common.

Douglas-fir regeneration typically occurs in dense clumps associated with past disturbance or rotting wood. The undergrowth is dominated by a nearly continuous cover of pinegrass, kinnikinnick, and red-stemmed feathermoss. Abundant kinnikinnick distinguishes these sites from those of the unlogged /01 site series. (Kinnikinnick often increases following logging on /01 sites.)

Wetter Sites Forested sites wetter than zonal sites occur primarily near the base of north-facing slopes, as narrow bands along stream courses, and at the perimeter of non-forested wetlands. They occupy a relatively small proportion of the landscape. Hybrid white spruce generally increases as sites become wetter and dominates the wettest sites.

07 SxwFd - Prickly rose - Sedge Site Series occurs on gentle north-facing slopes at mid to lower slope positions. It occurs down slope of the zonal site series but on soils without significant seepage inputs except early in the growing season and following heavy rains. The forest canopy is typically closed, and dominated by a mixture of hybrid white spruce and Douglas-fir. Lodgepole pine and paper birch are also often present. Undergrowth vegetation is dominated by pinegrass, red-stemmed feathermoss, twinflower, and prickly rose but may also include scattered moist-site indicators such as black twinberry, red-osier dogwood, and bunchberry. It is distinguished from the zonal site series by the presence of these moist-site species and from wetter sites by the low abundance of these species and wetter-site species such as sarsaparilla, highbush-cranberry, black gooseberry, horsetails, and leafy mosses.

08 SxwFd - Prickly rose - Sarsaparilla Site Series occurs on moist lower and toe slope positions, down slope of the /07 unit. Soils are moist throughout the growing season due to intermittent seepage inputs following snowmelt and summer precipitation. The forest canopy is closed, and dominated by a mixture of hybrid white spruce and Douglas-fir, often with scattered lodgepole pine, paper birch, and aspen in the lower canopy. Shrub cover is greater than on drier sites and includes highbush-cranberry, prickly rose, black twinberry, black huckleberry, and soopolallie. Several forb and grass species, including pinegrass, wild sarsaparilla, bunchberry, and twinflower, make up the productive herb layer. Moss cover is nearly continuous.

09 Sxw - Horsetail - Glow moss Site Series occurs on wet toe slope positions and depressions, often near the edge of wetlands. A water table is typically near (<50 cm) the surface and soils are usually gleyed. The forest canopy is relatively open and usually dominated by large, widely spaced hybrid white spruce trees with scattered regeneration on raised microsites. The undergrowth has abundant common horsetail or meadow horsetail. Several shrub species common in the /08 unit are also present in this site series. Other wet-site species that are more abundant in this than other site series include nodding wood-reed, palmate coltsfoot, and soft-leaved sedge. Some sites in this series are forested wetlands.

Non-forested Sites Non-forested wetlands are very common in the IDFdk3 (Steen and Roberts 1988). Shrub-carrs often border the forest, while fens and marshes occupy wetter areas. Small grasslands occur locally on south-facing slopes and in areas transitional to the IDFxm. Natural grasslands are usually dominated by bluebunch wheatgrass on south aspects and by porcupine grass, spreading needlegrass, or timber oatgrass on gentle sites.

Key to Site Units of the IDFdk3

1a. Soils extremely shallow (<50 cm over bedrock); ground lichens evident; cladonia and cladina lichen cover >1%; moisture regime very xeric or xeric.
IDFdk3/03 Fd - Juniper - Peltigera

1b. Soils not extremely shallow; lichens not evident; cladonia and cladina lichens <1%; moisture regime xeric to hygric.

  2a. Soil texture sand or loamy sand; gravel content usually >50%; no evidence of seepage inputs.

    3a. Slope aspect SE, S, SW, or W (100–280°) and slope gradient 20–44%; moisture regime xeric.
    IDFdk3/02 Fd - Juniper - Kinnikinnick

    3b. Slope aspect NW, N, NE, or E (281–360°, 0–99°) or slope <20%; moisture regime subxeric or submesic.
    IDFdk3/05 Fd - Feathermoss - Step moss

  2b. Soil texture loamy, silty, or clayey, or, if sand, then evidence of seepage present; gravel content usually <50%;

    4a. Slope >45%; soil parent materials usually colluvium.

      5a. Slope aspect NW, N, NE, or E (281–360°, 0–99°).
      IDFdk3/05 Fd - Feathermoss - Step moss

      5b. Slope aspect SE, S, SW, or W.
      IDFdk3/04 Fd - Bluebunch wheatgrass - Needlegrass

4b. Slope <45%; soil parent materials usually morainal.

6a. Slope aspect SE, S, SW, or W (100–280°) **and** slope gradient 15–44%.
IDFdk3/06 Fd - Pinegrass - Aster

6b. Slope aspect NW, N, NE, or E (281–360°, 0–100°) **or** slope gradient <15%.

7a. Moisture regime mesic to subhygric, water table not within 1 m of surface; horsetails absent or incidental.

8a. Moisture regime mesic, no evidence of seepage; hybrid white spruce absent or sparse; slope position level or mid; herb layer predominantly pinegrass.
IDFdk3/01 FdPl - Pinegrass - Feathermoss

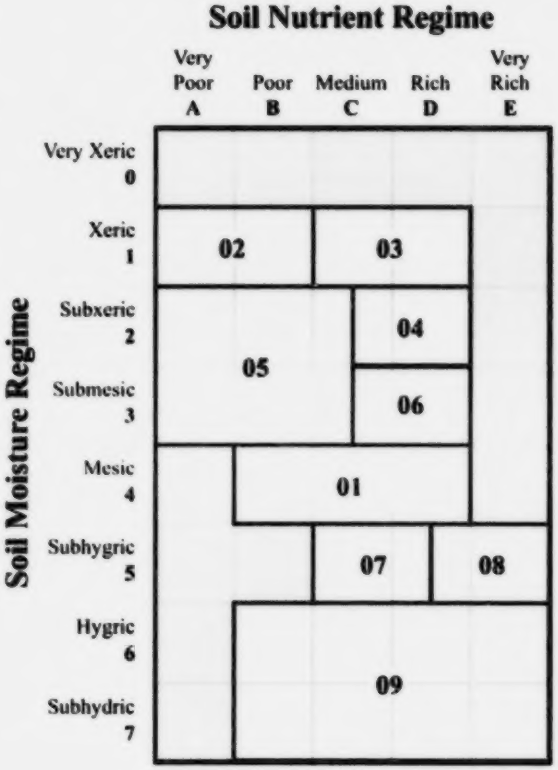
8b. Moisture regime subhygric, evidence of some seepage; hybrid white spruce common; generally north-aspect lower slopes; pinegrass not dominant in herb layer.

9a. Herbs and shrubs sparse; undergrowth predominantly mosses; wild sarsaparilla usually absent.
IDFdk3/07 SxwFd - Prickly rose - Sedge

9b. Herbs and/or shrubs abundant; mosses obscured by herbs and shrubs; wild sarsaparilla present.
IDFdk3/08 SxwFd - Prickly rose - Sarsaparilla

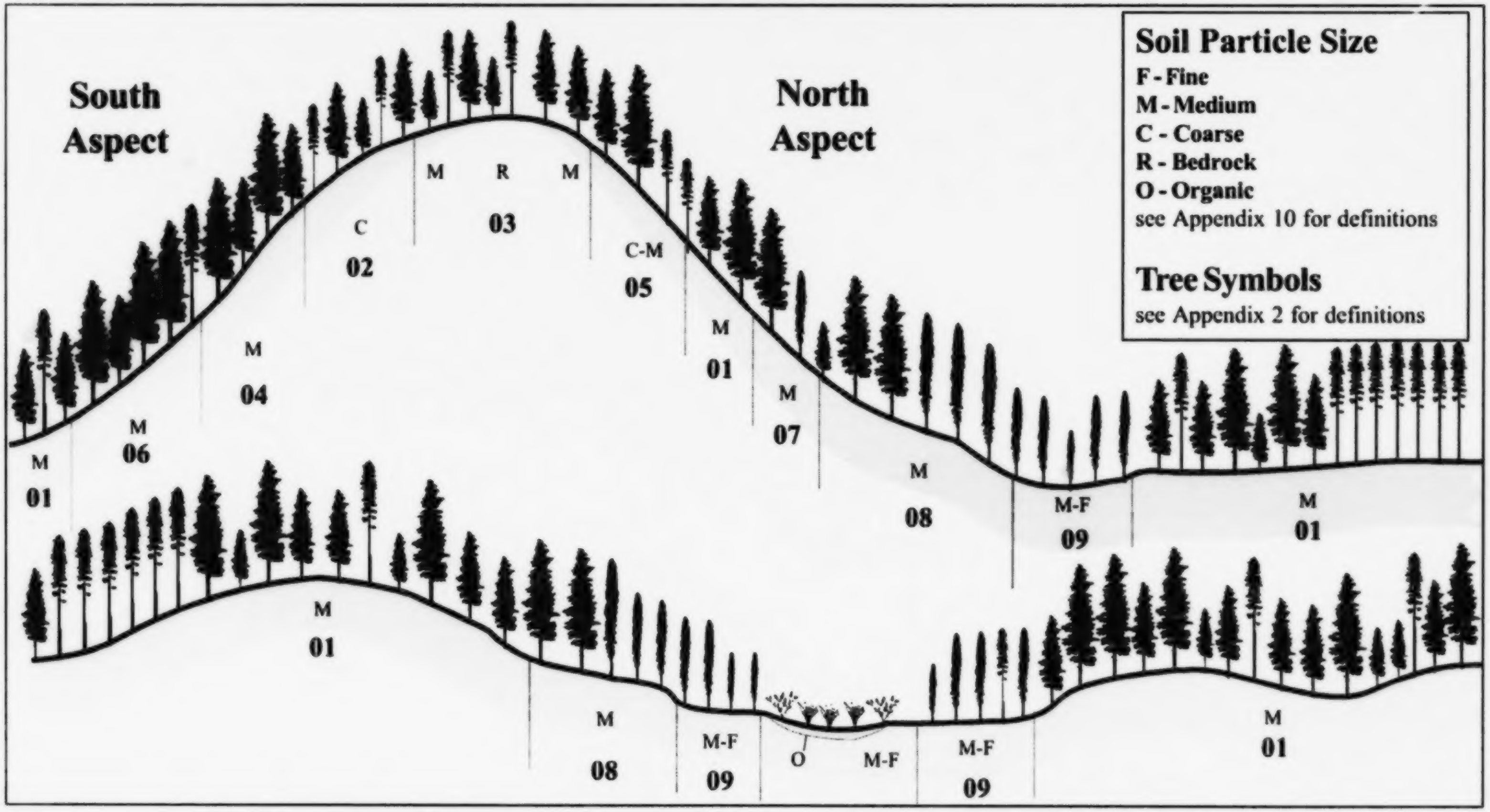
7b. Moisture regime hygric or subhydric, water table within 1m of surface; horsetails abundant.
IDFdk3/09 Sxw - Horsetail - Glow moss

IDFdk3 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
06
01
07
08
09

Site	**Series**
01	FdPl - Pinegrass - Feathermoss
02	Fd - Juniper - Kinnikinnick
03	Fd - Juniper - Peltigera
04	Fd - Bluebunch wheatgrass - Needlegrass
05	Fd - Feathermoss - Step moss
06	Fd - Pinegrass - Aster
07	SxwFd - Prickly rose - Sedge
08	SxwFd - Prickly rose - Sarsaparilla
09	Sxw - Horsetail - Glow moss

IDFdk3 Landscape Profile


South Aspect
North Aspect
M
01
M
06
M
04
C
02
M
R
M
03
C-M
05
M
01
M
07
M
08
M-F
09
M
01
M
01
M
08
M-F
09
O
M-F
M-F
09
M
01
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions

Site Features of IDFdk3 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other moderate to gently sloping sites with mesic or near-mesic moisture regime	moderate (20 - 44%) S- or W-facing slopes with sandy soils	upper and crest slope positions with very shallow (< 25 cm) soils over bedrock	steep (≥ 45%) S- and W-facing slopes with loamy soils	moderate to very steep (20 - 70%) N-facing slopes
Soil Moisture / Nutrient Regimes	mesic / medium	xeric / very poor, poor	xeric / medium, rich	subxeric / medium, rich	subxeric, submesic / very poor - medium
Slope Position	level, mid	upper, mid	crest, upper	upper, mid	upper, mid
Aspect	all	SE, S, SW, W	none	SE, S, SW, W	NW, N, NE, E
Slope Grade(%)	0 - 20	20 - 45	0 - 20	45 - 70	20 - 70
Soil Texture	loamy	gravelly sandy	loamy	loamy	sandy, loamy
Humus Form and Thickness (cm)	Hemimor 3 - 6	Xeromor 0 - 2	Rhizomor, Xeromor 0 - 5	Mullmoder 2 - 4	Hemimor, Mullmoder 3 - 5
Occurrence / Size / Distribution	predominant / large / wide	uncommon / moderate / wide	uncommon / small / wide	uncommon / moderate/ wide	common / small / wide

Site Features of IDFdk3 Site Series (continued)

Site Series	06	07	08	09
Key Features	moderately steep (15 - 44%) S-facing slopes with deep, loamy soils	moist lower slope positions on gentle (< 15%) N-facing slopes; loamy or sandy soils	gentle lower and toe slope positions with soils moistened by seepage; mostly down slope of /07	toe slope positions and depressions; water table near (< 50 cm) surface
Soil Moisture / Nutrient Regimes	submesic / medium, rich	subhygric / medium, rich	subhygric / rich, very rich	hygric, subhydric / poor - very rich
Slope Position	upper, mid	lower	lower, toe	toe, depression
Aspect	SE, S, SW, W	NW, N, NE, E	mostly NW, N, NE, E	none
Slope Grade (%)	15 - 45	2 - 15	2 - 15	0 - 2
Soil Texture	loamy	loamy	loamy	loamy, silty
Humus Form and Thickness (cm)	Hemimor, Mormoder 2 - 5	Hemimor 3 - 5	Hemimor 4 - 10	Hydromoder, Histomoder 10 - 50
Occurrence / Size / Distribution	common / small / wide	uncommon / small / wide	common / small / wide	common / small / wide

IDFdk3 Vegetation Table[a]

	Site Unit	02	03	04	05	06	01	07	08	09	
Tree	*Pseudotsuga menziesii*	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮		Douglas-fir
Layer	*Pinus contorta*				▮	▮	▮▮▮▮	▮▮▮			lodgepole pine
	Picea engelmannii x *glauca*							▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub	*Juniperus scopulorum*	▮	▮▮▮		▮						Rocky Mountain juniper
Layer	*Spiraea betulifolia*	▮▮▮	▮▮▮		▮▮▮	▮▮▮	▮		▮		birch-leaved spirea
	Rosa acicularis	▮▮▮	▮▮	▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	prickly rose
	Amelanchier alnifolia	▮▮▮		▮▮▮	▮▮	▮	▮	▮▮	▮▮		saskatoon
	Shepherdia canadensis	▮▮▮			▮▮▮	▮▮▮	▮▮▮		▮▮		soopolallie
	Populus tremuloides			▮▮			▮	▮▮	▮▮▮		trembling aspen
	Cornus stolonifera								▮▮	▮▮▮	red-osier dogwood
	Lonicera involucrata								▮▮▮	▮▮▮	black twinberry
	Viburnum edule								▮▮▮	▮	highbush-cranberry
Herb	*Festuca saximontana*	▮	▮▮								Rocky Mountain fescue
Layer	*Apocynum androsaemifolium*	▮▮▮									spreading dogbane
	Allium cernuum	▮▮	▮▮	▮▮▮	▮						nodding onion
	Elymus spicatus	▮	▮▮▮	▮▮▮▮	▮						bluebunch wheatgrass
	Solidago spathulata	▮▮	▮▮	▮▮	▮	▮▮	▮				spike-like goldenrod
	Arctostaphylos uva-ursi	▮▮▮▮▮		▮▮▮	▮▮	▮▮▮▮▮	▮▮▮				kinnikinnick
	Calamagrostis rubescens	▮	▮▮▮		▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮		pinegrass
	Aster conspicuus		▮▮	▮▮▮	▮	▮▮▮▮	▮▮▮	▮▮	▮▮		showy aster
	Astragalus miser			▮▮▮		▮▮▮					timber milk-vetch
	Orthilia secunda						▮▮▮	▮▮	▮▮		one-sided wintergreen
	Linnaea borealis				▮	▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	twinflower
	Arnica cordifolia					▮	▮▮▮		▮▮		heart-leaved arnica
	Lathyrus ochroleucus	▮			▮		▮	▮▮	▮▮		creamy peavine
	Cornus canadensis								▮▮▮		bunchberry
	Geocaulon lividum							▮	▮▮▮	▮	bastard toad-flax
	Aralia nudicaulis				▮▮				▮▮▮▮		wild sarsaparilla
	Mitella nuda								▮▮	▮▮▮	common mitrewort
	Rubus pubescens								▮▮▮	▮▮▮	trailing raspberry
	Carex disperma									▮▮▮▮	soft-leaved sedge
	Cinna latifolia									▮▮▮	nodding wood-reed
	Equisetum arvense									▮▮▮▮▮	common horsetail
Moss	*Hypnum revolutum*		▮▮▮								
Layer	*Peltigera rufescens*		▮▮▮▮			▮					felt pelt
	Cladonia spp.	▮▮	▮▮		▮▮	▮	▮▮	▮			cladonia lichens
	Pleurozium schreberi	▮▮	▮▮▮		▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Dicranum polysetum	▮▮	▮▮▮		▮▮▮	▮	▮▮▮	▮▮▮	▮▮▮		wavy-leaved moss
	Rhytidiadelphus triquetrus				▮▮		▮	▮▮▮▮▮	▮▮▮▮▮	▮	electrified cat's-tail moss
	Hylocomium splendens				▮▮▮		▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	step moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

IDFdk4
INTERIOR DOUGLAS-FIR
DRY COOL SUBZONE
CHILCOTIN VARIANT

The IDFdk4 occurs on the Fraser Plateau along either side of the Chilcotin River valley, west from the Fraser River valley to about Chilanko Forks. It also occurs along the west side of the Fraser River valley south of the Chilcotin River to about Lone Cabin Creek. A narrow finger of the IDFdk4 occurs in the Taseko River valley and an outlying area occurs against the leeward edge of the Coast Mountains south of Tatla Lake. Elevations range from about 1050 to 1350 m.

Distinguishing Adjacent Units from the IDFdk4

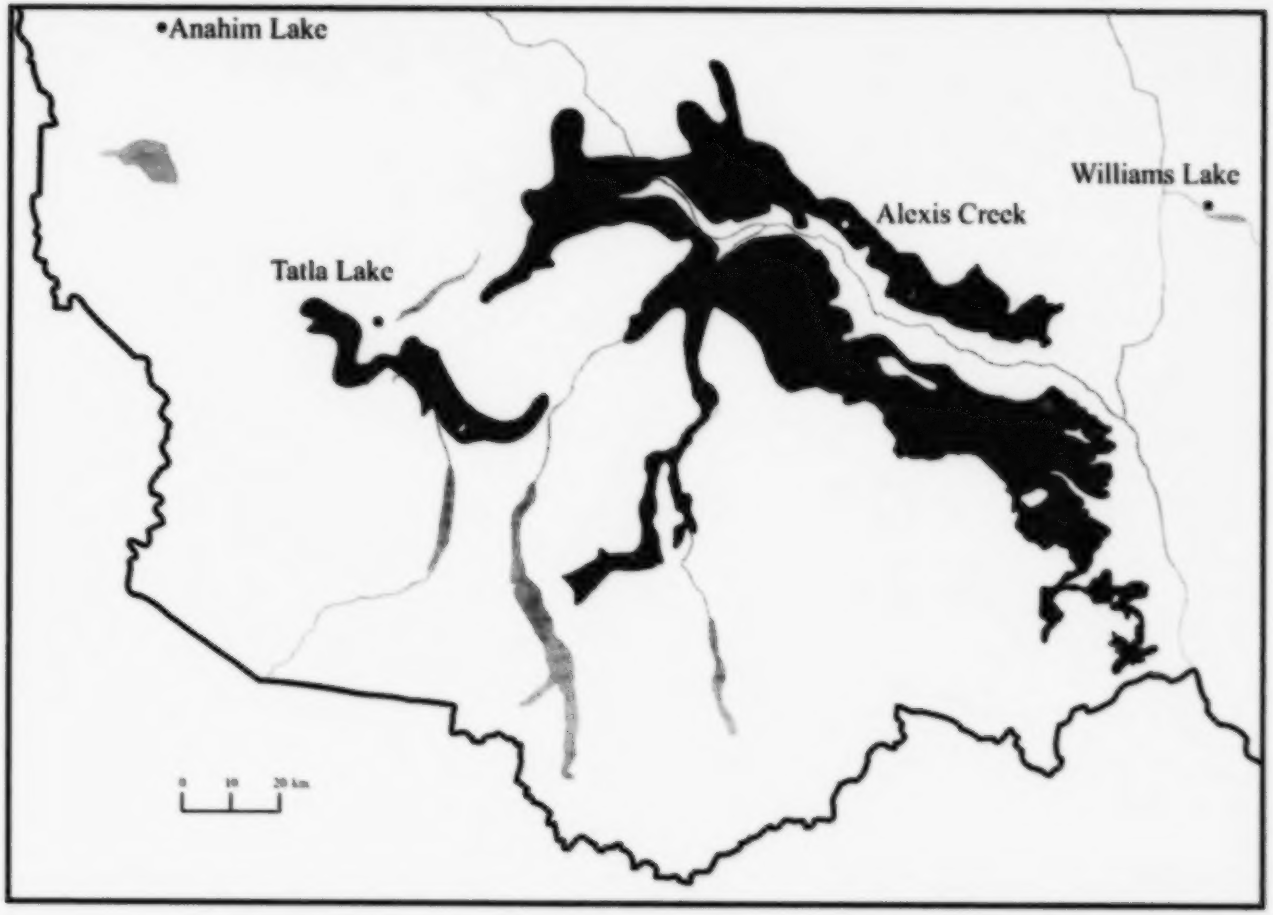
The **IDFdk3** replaces the IDFdk4 at similar elevations in the wetter, warmer climate east of the Fraser River as well as on the west side of the Fraser River north of the confluence of the Fraser and Chilcotin rivers. The **IDFxm** occurs at elevations below the IDFdk4 in the valleys of the Chilcotin River and the Fraser River. The **SBPSxc** occurs on colder, higher elevations (generally >1250 m) of the Fraser Plateau further removed from the Chilcotin River valley. The **MSxv** occurs at elevations above the IDFdk4 on the hills along the interior edge of the Coast Mountains, and the **IDFdw** replaces the IDFdk4 at low elevations in valley bottoms of the Coast Mountains. The **MSxk** lies above the IDFdk4 in the Camelsfoot Range, south of Churn Creek.

In the **IDFdk3**, zonal sites have:
- greater cover of twinflower than kinnikinnick;
- greater cover of mosses than lichens.

In the **IDFxm**, zonal sites have:
- bluebunch wheatgrass;
- no lodgepole pine or twinflower.

In the **IDFdw**, zonal sites have:
- abundant birch-leaved spirea;
- less abundant kinnikinnick and twinflower;
- little or no timber milk-vetch.

Distribution of IDFdk4 Variant in the Cariboo Forest Region


•Anahim Lake
Williams Lake
Alexis Creek
Tatla Lake
0 10 20 km

moist sites often have:
- subalpine fir and thimbleberry.

In the **SBPSxc**, zonal sites have:
- lodgepole pine or white spruce as climax tree species;
- bunchberry;
- no Douglas-fir;
- little or no timber milk-vetch.

In the **MSxv**, zonal sites have:
- hybrid white spruce as climax tree species;
- bunchberry, grouseberry, and crowberry;
- no Douglas-fir.

In the **MSxk**, zonal sites have:
- hybrid white spruce as climax tree species;
- common grouseberry.

SITE UNITS OF THE IDFdk4

Zonal Site Series **01 FdPl - Pinegrass - Feathermoss Site Series** dominates the IDFdk4 landscape. These sites are generally level to gently sloping, and vegetated by Douglas-fir (climax) or lodgepole pine (seral) forests. Small trembling aspen stands occur locally. The Douglas-fir stands are typically multi-aged with abundant, usually patchy Douglas-fir regeneration. Pine stands are typically uniform-aged with little pine regeneration but variable amounts of Douglas-fir regeneration. The undergrowth vegetation of both forests is dominated by pinegrass, mosses, lichens, and kinnikinnick. Only scattered shrubs are present.

Drier Sites Sites drier than those of the zonal site series are more common in the IDFdk4 than in the IDFdk3 due to the greater proportion of steeply sloping topography. They occur on ridge crests and upper slopes, on steep slopes, and on shallow or sandy soils. Moss cover is less than on the zonal sites, and several dryland vascular plants such as bluebunch wheatgrass, common juniper, and Rocky Mountain fescue are abundant. Pinegrass is less abundant and less vigorous.

02 Fd - Juniper - Peltigera Site Series occurs on areas of shallow (<50 cm) soils over bedrock, usually on crest and upper slope positions. These are relatively dry sites with a small soil volume available for tree rooting. The forest canopy is patchy, with gaps where bedrock is nearest the surface, and dominated by multi-sized Douglas-fir. A few small trembling aspen stems are often present. The undergrowth vegetation is dominated by common juniper, Rocky Mountain juniper, kinnikinnick, and lichens.

03 Fd - Juniper - Saskatoon Site Series occurs on moderate to steep south- or west-facing slopes with sandy soils. These are warm, very dry sites. The forest canopy is typically very open, patchy, and dominated by multi-sized Douglas-fir. Large standing dead trees are often present. Tree regeneration occurs primarily in the shade of, but not in the rainshadow directly beneath, canopy trees. The undergrowth is dominated by saskatoon, a variety of dry-land herbaceous plants, and lichens. Moss cover is sparse, and exposed mineral soil is common.

04 Fd - Juniper - Pasture sage Site Series also occurs on steep south- or west-facing slopes but has loam- or silt-textured soils. The forest canopy and tree regeneration layers are similar to the /03 unit, but the undergrowth differs by having a greater cover of common juniper, Rocky Mountain juniper, and grasses but less cover of lichens. These sites are also warm and dry but their soils have a higher nutrient-holding ability than those of the /03 unit.

05 Fd - Bluebunch wheatgrass - Pinegrass Site Series occurs on moderate-gradient (15–30%) south- to southwest-facing slopes and some steep west-facing slopes. Since these sites are less hot and dry than the /03 or /04 units, the forest canopy is nearly continuous. Douglas-fir dominates the forest canopy and tree regeneration layers, although tree regeneration is often sparse. The undergrowth is dominated by bluebunch wheatgrass, pinegrass, and kinnikinnick.

06 Pl - Kinnikinnick - Cladonia Site Series occurs on sandy gravelly fluvial terraces, most commonly near the lower elevation limits of the IDFdk4. The forest canopy is dominated by lodgepole pine, and the undergrowth by kinnikinnick and lichens. Douglas-fir is uncommon in the forest canopy but is often scattered in the regeneration layer. Lodgepole pine is the most abundant species of tree regeneration.

07 Fd - Feathermoss - Step moss Site Series occurs on steep (>30%) north- or east-facing slopes, which receive relatively little direct solar radiation. Snow patches often persist longer than on other sites. The canopy is relatively closed, often has a moderately dense subcanopy layer, and is dominated by Douglas-fir. The undergrowth is dominated by a carpet of feathermosses with relatively few vascular plants.

Wetter Sites Forested sites wetter than the zonal sites are generally small and localized. Few sites with evidence of seepage occur on hill slopes. Lower-slope seepage sites are primarily narrow bands at the base of long north- or east-facing slopes. Vegetation of wetter sites is distinguished by the presence of hybrid white spruce, bunchberry, or black twinberry.

08 Sxw - Scrub birch - Feathermoss Site Series typically occurs on lower slope positions at the edge of cold air accumulation basins occupied by non-forested wetlands or shrub-carrs. Surface soils are often moist, but a water table is not within 50 cm of the surface. The canopy is moderately open and dominated by hybrid white spruce and lodgepole pine. The undergrowth is distinguished by the presence of scrub birch and willows, primarily grey-leaved willow.

09 Sxw - Feathermoss - Brachythecium Site Series occurs on moist lower and toe slopes, often along stream channels. It generally does not occur adjacent to non-forested wetlands and shrub-carrs. The forest canopy is moderately closed, and dominated by hybrid white spruce, with scattered Douglas-fir, lodgepole pine, and aspen. The undergrowth is diverse and distinguished by abundant pinegrass, palmate coltsfoot, and star-flowered false Solomon's-seal.

10 Sxw - Horsetail - Glow moss Site Series occurs on wet toe slope positions and depressions where a water table is within 50 cm of the surface. Many sites are forested wetlands. The forest canopy is moderately closed to open, and dominated by hybrid white spruce. The undergrowth contains a variety of shrubs and wet-site herbaceous species. These sites are distinguished by abundant common horsetail.

Non-forested Sites Non-forested wetlands, moist meadows, and shrub-carrs are common in the IDFdk4. Wetlands are primarily fens, swamps, and marshes. Shrub-carrs are often extensive. Streamside riparian areas are commonly willow-dominated shrublands. Grasslands occur locally but are not common. On steep south slopes and dry hill crests, they are typically dominated by bluebunch wheatgrass, while on other areas they are commonly dominated by porcupine grass, spreading needlegrass, or timber oatgrass.

Key to Site Units of the IDFdk4

1a. Soils shallow, <50 cm over bedrock; usually crest or upper slope positions; bedrock outcrops usually present; cover of cladonia lichens >10%, and compact selaginella usually present.

IDFdk4/02 Fd - Juniper - Peltigera

1b. Soils deeper; slope position variable; bedrock outcrops not present; cover of cladonia lichens usually <10% (except in IDFdk4/06), and compact selaginella usually absent.

2a. Moisture regime xeric to mesic, no evidence of seepage inputs or water table within 1 m of surface; black twinberry, horsetails, scrub birch, black gooseberry, and palmate coltsfoot absent; spruce seldom present in canopy.

3a. Soil texture sand or loamy sand; purple reedgrass or spreading dogbane usually present except on north aspects.

4a. Slope gradient <15% **and** slope position not crest; landform usually glaciofluvial terrace; forest canopy dominated by lodgepole pine; cladonia and cladina lichens abundant (cover usually >20%).

IDFdk4/06 Pl - Kinnikinnick - Cladonia

4b. Slopes steeper or slope position crest; landform variable; forest canopy dominated by Douglas-fir or lodgepole pine; cover of cladina and cladonia lichens <20%.

5a. Slope aspect SE, S, SW, or W (145–295°), or slope position crest; shrubby penstemon and lance-leaved stonecrop usually present.

IDFdk4/03 Fd - Juniper - Saskatoon

5b. Slope aspect NW, N, NE, or E (296–360°, 0–144°), slope position not crest; shrubby penstemon and lance-leaved stonecrop usually absent.

6a. Slope gradient >30%; undergrowth dominated by

moss carpet; step moss cover >20%, and kinnikinnick usually absent.
IDFdk4/07 Fd - Feathermoss - Step moss

6b. Slope gradient <30%; undergrowth not dominated by moss carpet; step moss cover <20%, and kinnikinnick usually present.
IDFdk4/01 FdPl - Pinegrass - Feathermoss

3b. Soil texture loamy, silty, or clayey; purple reedgrass and spreading dogbane absent or cover <1%.

7a. Slope gradient >15% **and** aspect SSE to W (145–295°); moisture regime xeric to submesic; bluebunch wheatgrass present.

8a. Aspect S or SW (170–235°) **and** slope gradient >30%; Rocky Mountain juniper usually present and pinegrass cover <10%; moisture regime xeric or subxeric.
IDFdk4/04 Fd - Juniper - Pasture sage

8b. Aspect not S or SW or, if so, then slope gradient <30%; Rocky Mountain juniper absent or incidental and pinegrass cover usually >10%; moisture regime subxeric or submesic.
IDFdk4/05 Fd - Bluebunch wheatgrass - Pinegrass

7b. Slope gradient <15% **or** aspect NW to SE (296–360°, 0–144°); moisture regime submesic to subhygric; bluebunch wheatgrass absent.

9a. Aspect NW, N, or NE (296–360°, 0–65°) **and** slopes >30%; undergrowth dominated by moss carpet; step moss present and kinnikinnick absent.
IDFdk4/07 Fd - Feathermoss - Step moss

9b. Aspect not NW, N, or NE or, if so, then slope gradient <30%; undergrowth not dominated by moss carpet; step moss absent or incidental, and kinnikinnick present.
IDFdk4/01 FdPl - Pinegrass - Feathermoss

2b. Moisture regime subhygric to subhydric, evidence of free seepage water or water table within 1 m of surface; black twinberry, horsetails, scrub birch, black gooseberry, or palmate coltsfoot present; spruce usually present in canopy.

10a. Moisture regime subhygric, water table not within 50 cm of surface; common horsetail not abundant (cover <5%), and soft-leaved sedge absent or incidental; soopolallie usually present.

11a. Black twinberry present, scrub birch usually absent; lower or toe slope positions often near stream channel; rarely adjacent to non-forested wetland.

IDFdk4/09 Sxw - Feathermoss - Brachythecium

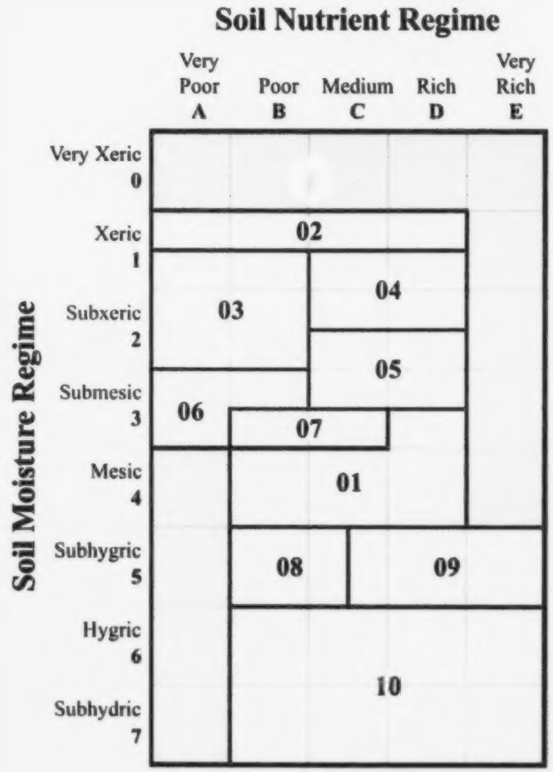
11b. Black twinberry absent, scrub birch present; lower or toe slope positions usually adjacent to non-forested depressional wetland.

IDFdk4/08 Sxw - Scrub birch - Feathermoss

10b. Moisture regime hygric or subhydric, water table within 50 cm of surface; common horsetail abundant and soft-leaved sedge usually present; soopolallie absent or incidental.

IDFdk4/10 Sxw - Horsetail - Glow moss

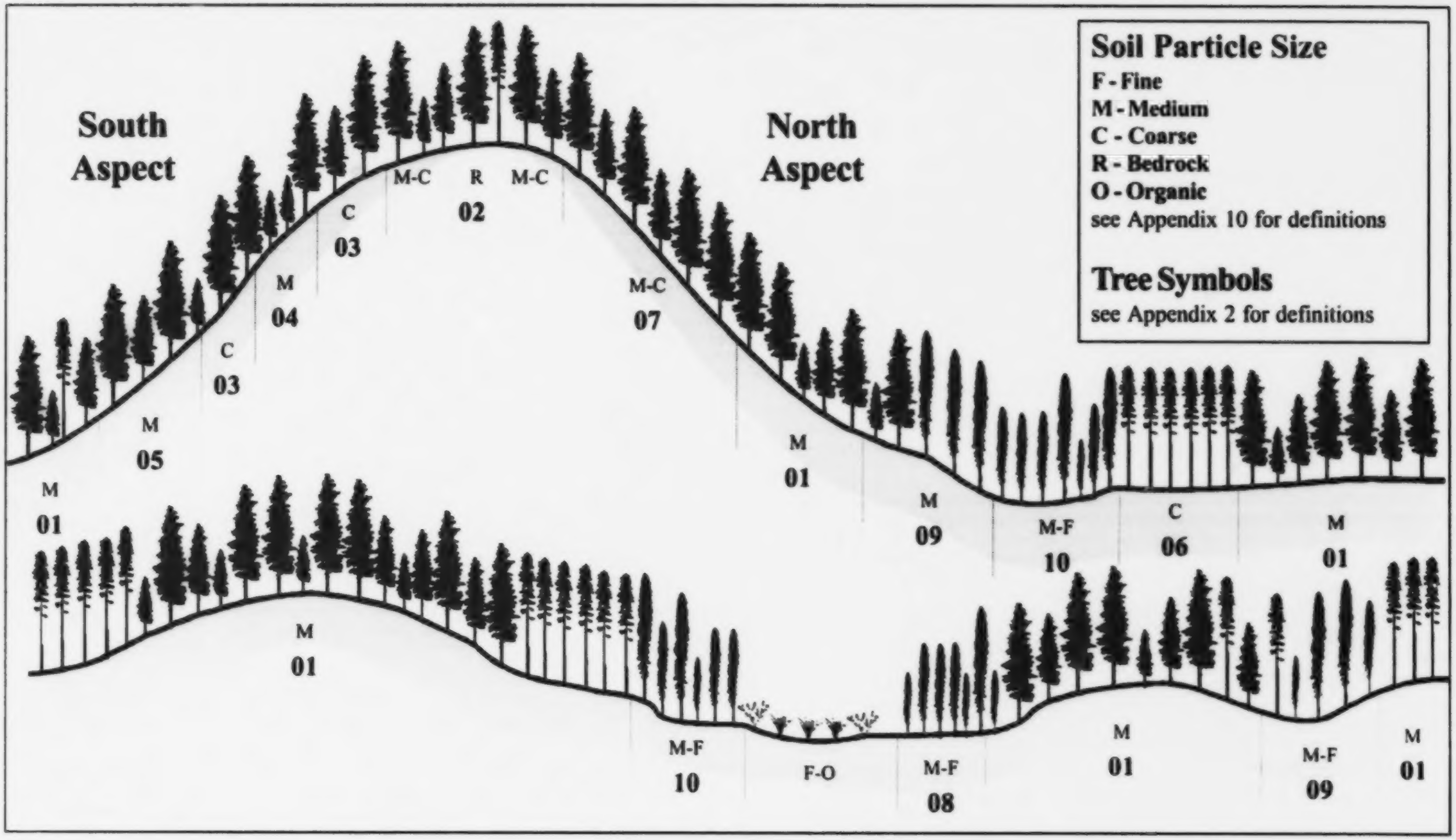
IDFdk4 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
06
07
01
08
09
10

Site Series

01	FdPl - Pinegrass - Feathermoss
02	Fd - Juniper - Peltigera
03	Fd - Juniper - Saskatoon
04	Fd - Juniper - Pasture sage
05	Fd - Bluebunch wheatgrass - Pinegrass
06	Pl - Kinnikinnick - Cladonia
07	Fd - Feathermoss - Step moss
08	Sxw - Scrub birch - Feathermoss
09	Sxw - Feathermoss - Brachythecium
10	Sxw - Horsetail - Glow moss

IDFdk4 Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M 01
M 05
C 03
M 04
C 03
M-C
R 02
M-C
M-C 07
M 01
M 09
M-F 10
C 06
M 01
M 01
M-F 10
F-O
M-F 08
M 01
M-F 09
M 01

Site Features of IDFdk4 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently sloping sites with mesic or near mesic moisture regime	upper and crest slope positions with shallow (< 50 cm) soils over bedrock	moderate to steep (> 15%) S- and W-facing slopes with sandy soils	steep (> 30%) S- and W- facing slopes with loamy or silty soils	moderate (15 - 30%) S- to SW- facing slopes with loamy soils; also some steep (>30%) SE- and W-facing slopes
Soil Moisture / Nutrient Regimes	mesic (submesic) / poor - rich	xeric / very poor - rich	xeric - subxeric / very poor, poor	subxeric, xeric / medium, rich	subxeric , submesic / medium, rich
Slope Position	level, mid	crest, upper	upper, mid, crest	upper, mid, crest	upper, mid, crest
Aspect	all	all	SE, S, SW, W	SE, S, SW, W	SE, S, SW, W
Slope Grade (%)	0 - 20	0 - 45	> 15	> 30	> 15
Soil Texture	loamy	loamy, often gravelly	sandy, often gravelly	loamy	loamy
Humus Form and Thickness (cm)	Hemimor 2 - 5	Xeromor 0 - 4	Xeromor 0 - 2	Xeromor 1 - 3	Hemimor, Xeromor 1 - 3
Occurrence / Size/ Distribution	predominant / large / wide	common / small / wide	uncommon / moderate / wide	common / moderate / wide	common / moderate / wide

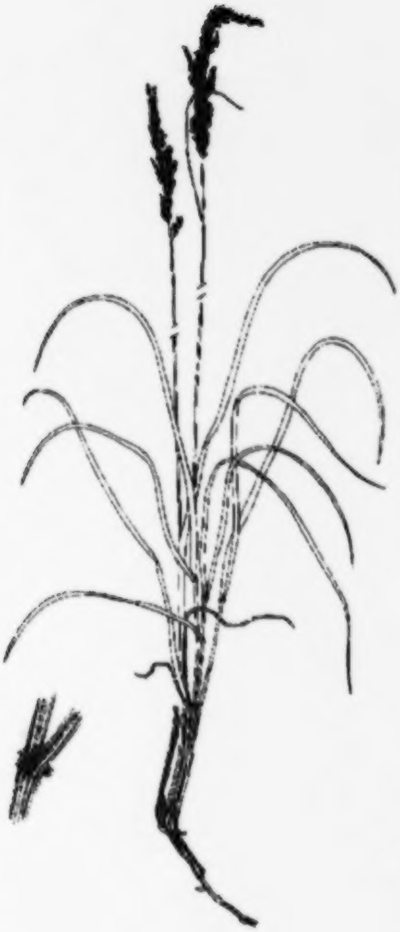
Site Features of IDFdk4 Site Series (continued)

Site Series	06	07	08	09	10
Key Features	sandy, gravelly fluvial terraces; level to gentle slopes (< 15%) mostly at toe slope positions	steep (> 30%) N- and NE-facing slopes	moist lower and toe slope positions with intermittent or low-volume seepage at perimeter of cold air basins; often adjacent to wetland	moist lower and toe slope seepage sites without near-surface water table; often near stream channel	wet toe slope positions and depressions with near-surface (< 50 cm) water table; often adjacent to wetland
Soil Moisture / Nutrient Regimes	submesic / very poor, poor	submesic / poor, medium	subhygric / poor, medium	subhygric / medium - very rich	hygric, subhydric / poor - very rich
Slope Position	level, toe	upper, mid, crest	lower, toe	lower, toe	toe, depression
Aspect	all	NW, N, NE, E	all	all	none
Slope Grade (%)	0 - 15	> 30	0 - 10	0 - 10	0 - 5
Soil Texture	sand	loamy (sand)	sand, loamy	loamy, sand	loamy, silty, organic
Humus Form and Thickness (cm)	Hemimor, Xeromor 1 - 3	Hemimor 4 - 10	Hemimor 5 - 18	Hemimor, Humimor 10 - 40	Hemimor, Hemihumimor, Humimor 25 - 40
Occurrence / Size / Distribution	uncommon / moderate / wide	common / moderate / wide	common / small / wide	common / small / wide	common / small / wide

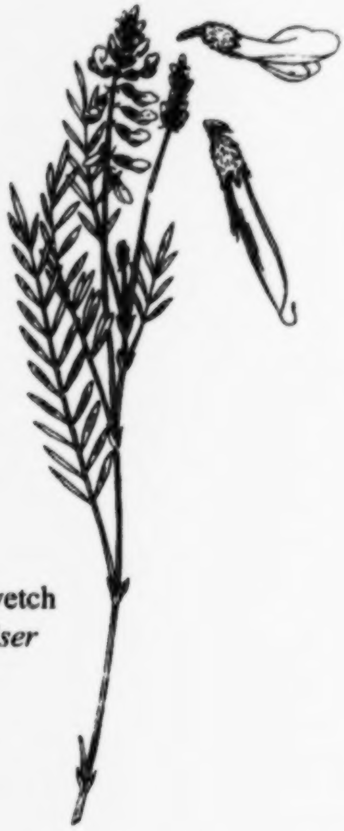
IDFdk4 Vegetation Table[a]

	Site Unit	02	03	04	05	06	07	01	08	09	10	
Tree Layer	*Pseudotsuga menziesii*	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮		▮▮▮▮▮	▮▮▮▮▮				Douglas-fir
	Pinus contorta	▮				▮▮▮▮▮		▮▮▮	▮▮▮			lodgepole pine
	Picea engelmannii x *glauca*								▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub Layer	*Juniperus scopulorum*	▮▮▮	▮	▮▮▮▮								Rocky Mountain juniper
	Juniperus communis	▮▮▮▮	▮	▮▮▮	▮	▮			▮▮			common juniper
	Amelanchier alnifolia	▮	▮▮▮▮	▮▮		▮▮			▮▮			saskatoon
	Rosa acicularis	▮▮	▮▮	▮▮▮	▮	▮▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	prickly rose
	Shepherdia canadensis		▮▮			▮▮▮	▮▮	▮▮▮	▮▮▮▮	▮▮▮		soopolallie
	Populus tremuloides	▮		▮				▮	▮▮▮	▮		trembling aspen
	Betula glandulosa								▮▮			scrub birch
	Lonicera involucrata									▮▮▮	▮▮▮	black twinberry
Herb Layer	*Selaginella densa*	▮▮										compact selaginella
	Penstemon fruticosus	▮▮	▮									shrubby penstemon
	Erigeron speciosus	▮	▮▮	▮▮	▮▮							showy fleabane
	Antennaria umbrinella	▮	▮	▮	▮▮▮							umber pussytoes
	Koeleria macrantha	▮▮		▮▮▮	▮	▮▮						junegrass
	Elymus spicatus	▮	▮▮▮	▮▮▮	▮▮▮▮	▮						bluebunch wheatgrass
	Festuca saximontana	▮▮	▮▮	▮	▮▮	▮						Rocky Mountain fescue
	Achillea millefolium	▮▮	▮▮	▮▮	▮▮	▮▮	▮▮	▮▮	▮▮	▮▮		yarrow
	Solidago spathulata	▮▮	▮▮▮	▮▮	▮▮	▮▮		▮▮	▮▮			spike-like goldenrod
	Arctostaphylos uva-ursi	▮▮▮▮	▮	▮▮	▮▮▮	▮▮▮▮▮		▮▮▮▮▮	▮▮			kinnikinnick
	Astragalus miser	▮		▮▮	▮▮			▮▮▮	▮▮			timber milk-vetch
	Calamagrostis rubescens	▮	▮	▮	▮▮▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮		pinegrass
	Linnaea borealis							▮▮▮	▮▮▮	▮▮▮	▮▮▮	twinflower
	Smilacina stellata								▮▮	▮▮▮	▮	star-flowered false Solomon's-seal
	Antennaria pulcherrima								▮▮▮	▮		showy pussytoes
	Petasites palmatus									▮▮▮	▮▮▮	palmate coltsfoot
	Equisetum scirpoides									▮▮▮	▮▮▮▮	dwarf scouring-rush
	Equisetum arvense									▮▮▮	▮▮▮▮▮	common horsetail
	Mitella nuda									▮	▮▮▮	common mitrewort
	Carex disperma										▮▮▮	soft-leaved sedge
Moss Layer	*Tortula ruralis*	▮▮▮	▮▮▮	▮▮								sidewalk moss
	Cladonia spp.	▮▮▮▮▮	▮▮▮	▮	▮▮▮	▮▮▮▮▮	▮▮	▮▮▮	▮▮	▮		cladonia lichens
	Peltigera spp.	▮▮▮▮▮	▮▮▮	▮	▮▮▮	▮▮▮▮▮	▮▮	▮▮▮	▮▮▮▮	▮	▮	pelt lichens
	Dicranum polysetum					▮	▮▮▮	▮▮▮	▮▮▮			wavy-leaved moss
	Pleurozium schreberi	▮			▮		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮		red-stemmed feathermoss
	Ptilium crista-castrensis						▮▮▮			▮		knight's plume
	Hylocomium splendens						▮▮▮▮▮	▮	▮▮	▮▮▮▮▮	▮	step moss
	Aulacomnium palustre										▮▮▮	glow moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Pinegrass
Calamagrostis rubescens



Timber milk-vetch
Astragalus miser

IDFdw
INTERIOR DOUGLAS-FIR
DRY WARM SUBZONE

The IDFdw is a relatively small (1009 km^2) subzone that occurs in broad, low-elevation valleys of the Coast Mountains, primarily those of Chilko Lake, Tatlayoko Lake, Mosley Creek, and the Klinaklini River. A smaller area occurs in the Atnarko and Hotnarko valleys. The IDFdw occurs in an area of rapid climatic change from the dry, strongly Interior climates of the IDFdk4 to the coastal transition climates of the IDFww and the CWHds in the Vancouver Forest Region. The IDFdw occurs from valley bottoms to elevations of approximately 1200–1400 m, with upper elevations generally decreasing with distance from the Interior plateau.

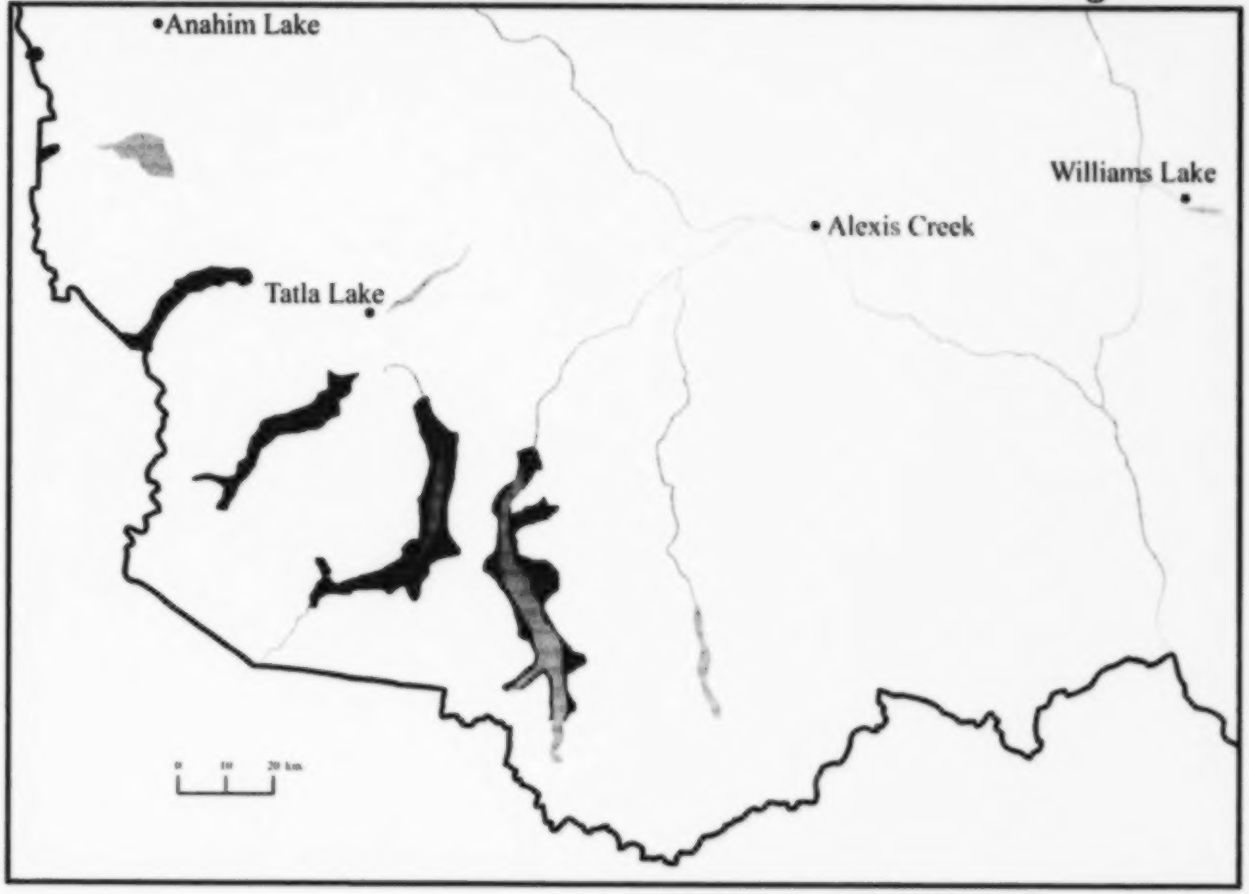
Distinguishing Adjacent Units from the IDFdw

The **MSdc2** occurs above the IDFdw throughout most of its distribution. On some very steep mountain slopes, however, the **ESSFxv1** is mapped directly above IDFdw. On these steep slopes, upper elevations of the IDFdw and lower elevations of the ESSFxv1 may have vegetation similar to the MSdc2. The **IDFdk4** and **SBPSxc** both occur at elevations similar to those of the IDFdw. They border the IDFdw where the Coast Mountain valleys open onto the Interior plateau. The IDFdk4 occurs in areas that are slightly warmer than the SBPSxc. The **CWH** Zone replaces the IDFdw in valley bottoms of the Homathko River and Mosley Creek near the Vancouver Forest Region where precipitation patterns and amounts are more similar to coastal environments. The **CWH** Zone also borders the IDFdw at the southern end of Chilko Lake.

In the **MSdc2**, zonal sites have:
- climax forests dominated by hybrid white spruce and/or subalpine fir;
- little or no pinegrass.

In the **ESSFxv1**, zonal sites have:
- climax forests dominated by Engelmann spruce (or hybrid white spruce)

Distribution of IDFdw Subzone in the Cariboo Forest Region


Anahim Lake
Williams Lake
Alexis Creek
Tatla Lake
0
10
20 km

and/or subalpine fir;
- common grouseberry and arctic lupine;
- little or no pinegrass.

In the **IDFdk4**, zonal sites have:
- less soopolallie and more pinegrass.

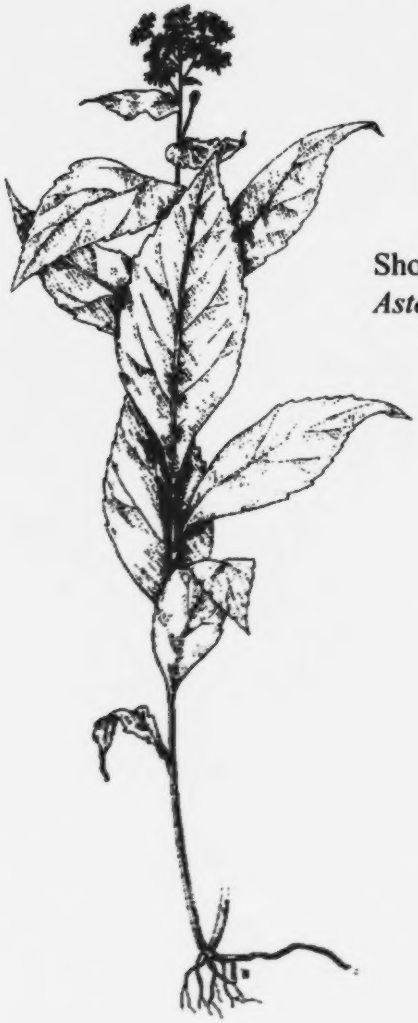
moist sites have:
- frequent subalpine fir and thimbleberry;
- no devil's club (occasionally abundant in IDFdw).

In the **SBPSxc**, zonal sites have:
- little or no Douglas-fir;
- less common and less vigorous pinegrass;
- more common kinnikinnick and cladonia lichens.

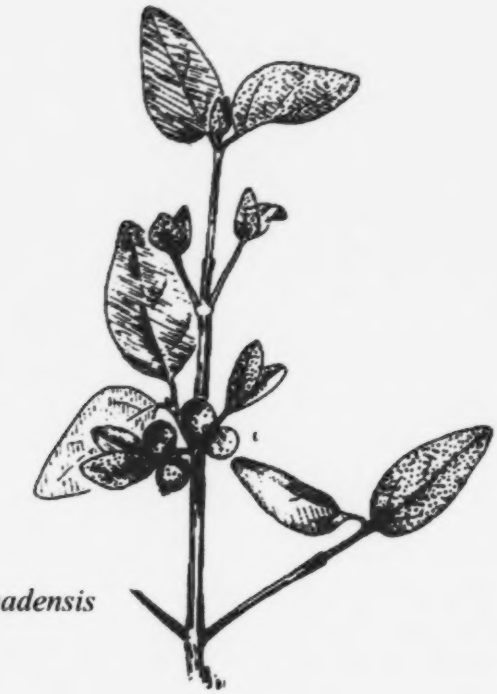
In the **CWH**, zonal sites have:
- climax forests dominated by western redcedar and western hemlock.

Site Units of the IDFdw

Initial ecosystem surveys have been conducted in the IDFdw but survey data are currently not sufficient to develop a site classification. A site classification will be prepared in the near future and made available as an insert to this field guide.



Showy aster
Aster conspicuus



Soopolallie
Shepherdia canadensis

IDFmw2
INTERIOR DOUGLAS-FIR MOIST WARM SUBZONE THOMPSON VARIANT

The IDFmw2 covers only a small portion (147 km^2) of the Cariboo Forest Region on lower valley slopes surrounding Canim Lake. Elevations are from valley bottom (760 m) to approximately 900 m. The IDFmw2 occurs primarily on the Shuswap Highland in the Kamloops Forest Region.

Distinguishing Adjacent Units from the IDFmw2
(Cariboo Forest Region only)

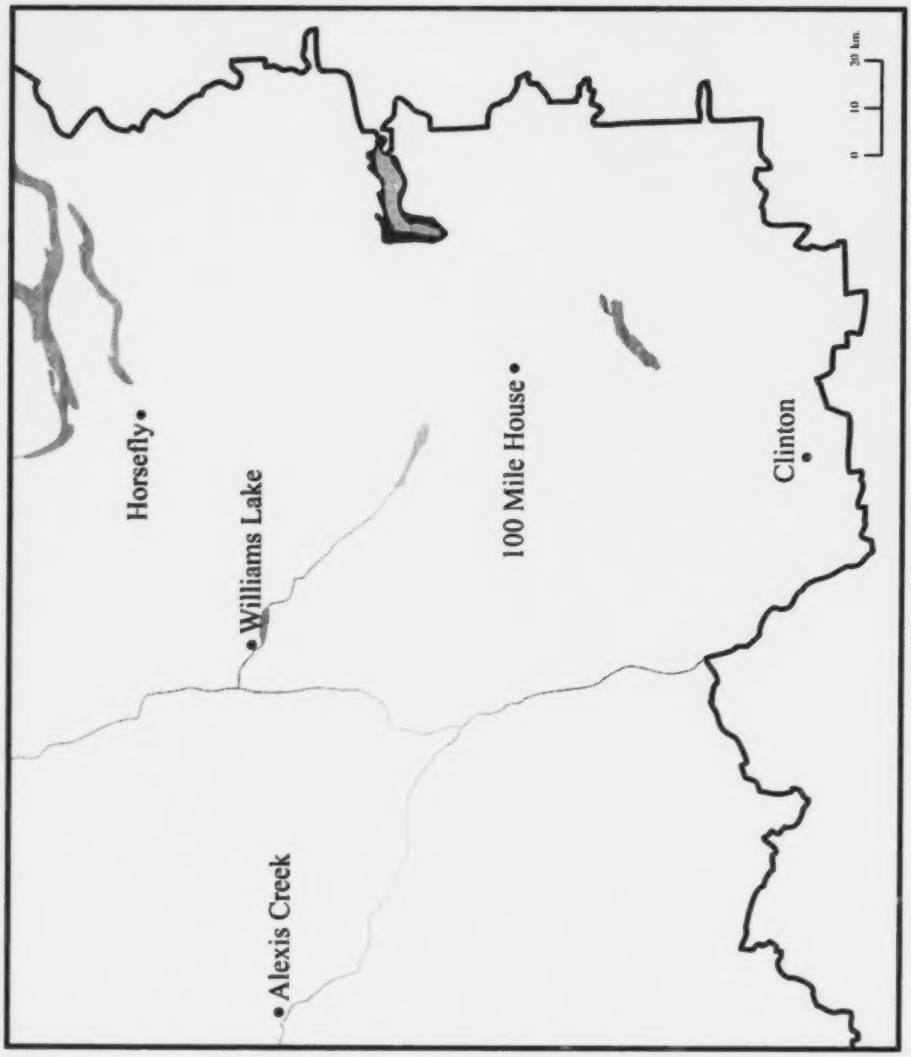
The **ICHdk** occurs at higher elevations north of the IDFmw2 on the landscape rising toward the Quesnel Highland. The **SBSdw1** occurs at higher elevations on the gently rolling terrain of the Fraser Plateau west and south of Canim Lake. An outlier of the **ICHmk3** occurs on a local height-of-land south of the IDFmw2 and the **SBSmm** occurs at higher elevations on the Shuswap Highland at the eastern limits of the Cariboo Forest Region.

In the **ICHdk**, zonal sites have:
- subalpine fir;
- western redcedar often present in forest canopy;
- common black huckleberry, rosy twistedstalk, one-leaved foamflower, and five-leaved bramble.

In the **ICHmk3**, zonal sites have:
- subalpine fir;
- western redcedar often dominating forest canopy;
- common bunchberry, black huckleberry, three-leaved foamflower, and five-leaved bramble;
- little or no pinegrass.

In the **SBSdw1**, zonal sites have:
- common hybrid white spruce;
- subalpine fir often in regeneration layers;
- common bunchberry and black huckleberry.

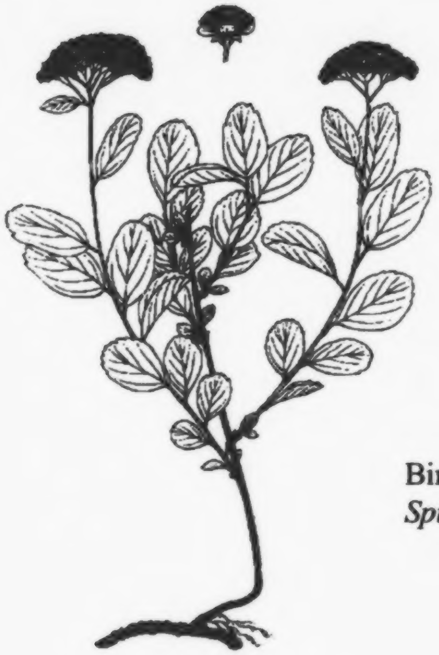
Distribution of IDFmw2 Variant in the Cariboo Forest Region


Horsefly
Williams Lake
100 Mile House
Clinton
Alexis Creek
0
10
20 km.

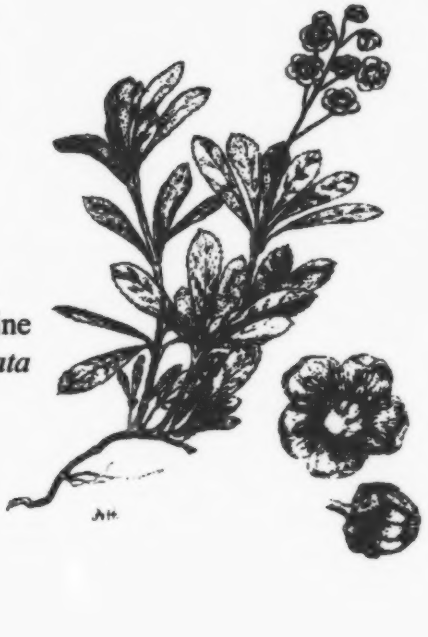
In the **SBSmm**, zonal sites have:
- common subalpine fir and hybrid white spruce;
- common bunchberry and black huckleberry.

Site Units of the IDFmw2

Site units of the IDFmw2 are classified and described by Lloyd *et al.* (1990) for the Kamloops Forest Region and generally apply to the IDFmw2 in the Cariboo Forest Region. Refer to Lloyd *et al.* (1990) for descriptions of these site units.



Birch-leaved spirea
Spiraea betulifolia



Prince's pine
Chimaphila umbellata

IDFxm
INTERIOR DOUGLAS-FIR
VERY DRY MILD SUBZONE

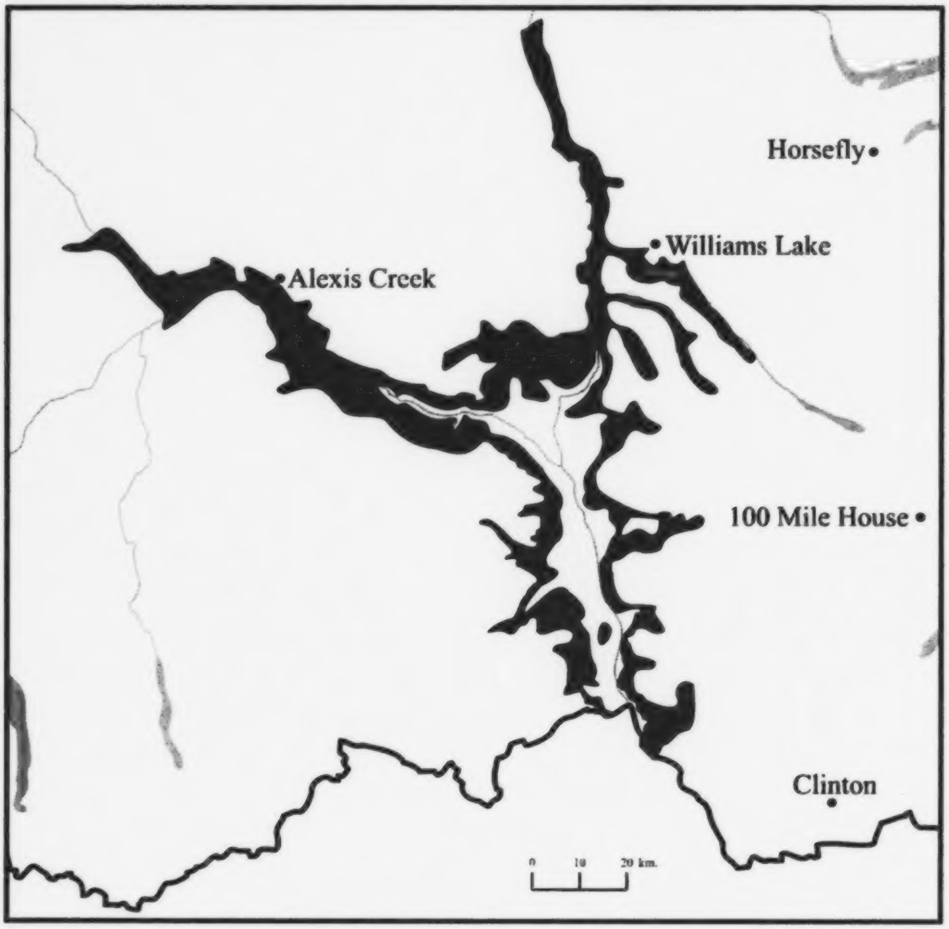
The IDFxm occurs primarily in the Fraser and Chilcotin river valleys south of about Alexandria and east of Redstone, respectively. In the Fraser River valley, south of the confluence with the Chilcotin River, it occurs on middle and upper valley slopes. North of the confluence with the Chilcotin River, it includes lower valley slopes as well. In the Chilcotin River valley it occurs on middle and upper valley slopes near the Fraser River but includes all valley slopes near Alexis Creek. Further west towards Redstone, it is increasingly restricted to lower valley slopes. Elevations are generally 800–1200 m and occasionally as high as 1200 m.

Distinguishing Adjacent Units from the IDFxm

The **IDFdk3** occurs at higher elevations along the east side of the Fraser River valley. North of the confluence of the Fraser and Chilcotin rivers, it also occurs above the IDFxm along the west side of the Fraser River. The **IDFdk4** occurs at higher elevations along the west side of the Fraser River Valley south of the Chilcotin River confluence. It also occurs above the IDFxm along both sides of the Chilcotin River valley. The **SBSdw2** occurs at higher elevations along the Fraser River valley at the northernmost limits of the IDFxm, north of Macalister. The **IDFxw** occurs at similar elevations south of Big Bar Creek, along the west side of the Edge Hills where the climate is warmer and drier. The **SBSmh** occurs at similar elevations in the Fraser River valley north of about Alexandria. The **BGxw2** occurs below the IDFxm on middle and some lower valley slopes of the Fraser and Chilcotin river valleys.

In the **IDFdk3** and the **IDFdk4**, zonal sites have:
- lodgepole pine (also present in IDFxm on some level and gently sloping areas near IDFdk boundary);
- twinflower;
- no bluebunch wheatgrass, spreading needlegrass, Rocky Mountain juniper, or arrow-leaved balsamroot.

Distribution of IDFxm Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0
10
20 km.

In the **IDFxw**, zonal sites have:
- ponderosa pine;
- little or no common snowberry;
- greater abundance of bluebunch wheatgrass.

In the **SBSdw2**, zonal sites have:
- lodgepole pine and hybrid white spruce;
- twinflower, bunchberry, and black twinberry.

In the **SBSmh**, zonal sites have:
- hybrid white spruce;
- bunchberry and red-osier dogwood.

In the **BGxw2**, zonal sites have:
- grasslands, not forests, as climax vegetation;
- no pinegrass.

Site Units of the IDFxm

The site series classification described here does not include the small forest patches that occur within a grassland matrix in the forest/grassland parklands of the IDFxm. These parklands are most extensive on Becher's Prairie.

Zonal Site Series **01 Fd - Pinegrass - Feathermoss Site Series** is the most extensive site series of the IDFxm, occupying in the order of 30–40% of the landscape. Sites are generally level to moderately sloping, with medium-textured soils. Douglas-fir dominates the forest canopy and tree regeneration layers of nearly all stands. Small trembling aspen stands occur occasionally within the Douglas-fir forest matrix and at the transition between these forests and the many grasslands that occur within the IDFxm. The Douglas-fir stands have a moderately closed canopy and are single- to multi-storied, depending in part on the history of wildfires that have destroyed small but not larger stems. Tree regeneration is generally less dense than in the IDFdk. The undergrowth contains a sparse to moderate cover of shrubs, several grass species (some are also common in the open grasslands), and several low-growing, dry-land forb species. Moss cover is typically patchy. Most sites in this series are included in the /01a Typic Phase.

01b Cold Phase occurs locally in the Chilcotin River valley on sites that meet all criteria for zonal sites except that they are cold air accumulation sites. They typically occur on level benches and shallow depressions on mid to lower valley slopes. They are small, uncommon, and distinguished by a lodgepole pine–dominated canopy. Lichens are usually more abundant than in the Typic Phase of the /01 Site Series.

Drier Sites Sites drier than the zonal sites are very common, occurring primarily on steep valley slopes and on gentle slopes with sandy soils. Compared to zonal sites, forests on these sites have a more open canopy, fewer herbaceous species, and less moss cover. Bluebunch wheatgrass is a principal species of the undergrowth. Grasslands are common on these sites.

02 Fd - Bluebunch wheatgrass - Penstemon Site Series occurs on moderate to steep (>25%) south- or west-facing slopes with sandy soils (/02a - Typic Phase), and also on ridge and hill crests with shallow soils over bedrock (/02b - Shallow Phase). These are very dry sites with slow tree growth. The forest canopy is characterized by patches or clumps of multi-sized Douglas-fir stems. Open shrub- or grass-dominated areas occur between the clumps. Tree regeneration is typically sparse and occurs primarily in the shade (but not in the "rainshadow" directly beneath the canopy) of larger trees. The undergrowth is relatively sparse and dominated by shrubs and bluebunch wheatgrass. The forest floor is discontinuous and much of the surface is exposed mineral soil.

03 Fd - Juniper - Cladonia Site Series includes level to gently sloping sites with sandy soils of glaciofluvial origin. In contrast to other IDFxm site series, lodgepole pine is common and typically dominates the forest canopy. Douglas-fir is the principal species of tree regeneration but lodgepole pine stems are usually present below the frequent canopy gaps. The undergrowth is dominated by kinnikinnick, common juniper, and lichens. Grasses are always present but not abundant. These sites are relatively uncommon. Abundant lodgepole pine and kinnikinnick and relatively little grass cover distinguishes mature vegetation of these sites.

04 Fd - Bluebunch wheatgrass - Pasture sage Site Series occurs on moderate and steep (>25%) south- and west-facing slopes with medium- to fine-textured soils. These are relatively hot, very dry sites, and they are common. Tree cover is patchy, consisting of multi-sized Douglas-fir and occasional trembling aspen. Tree regeneration is sparse and primarily in the partial shade of larger trees. The undergrowth is dominated by shrubs, including Rocky Mountain juniper and saskatoon, and bluebunch wheatgrass. Shrub and grass cover is greater than in the /02 site series. The forest floor is dry and discontinuous and much of the surface is exposed mineral soil.

05 Fd - Feathermoss - Stepmoss Site Series occurs on steep (>35%) north- and east-facing slopes. The mature forest canopy is dominated by Douglas-fir and moderately closed. Tree regeneration is more dense than in the /02, /03, and /04 site series. The undergrowth is dominated by a carpet of mosses, primarily stepmoss and red-stemmed feathermoss, which distinguishes these from other IDFxm sites. Several vascular plant species are typically present but their cover is low. Principal shrubs are birch-leaved spirea and prickly rose, while common herbaceous species include bluebunch wheatgrass, pinegrass, and showy aster.

Wetter Sites Sites wetter than the zonal sites are relatively uncommon and small. They occur primarily on valley floors, in small depressions, and as a narrow band at the base of north- and east-facing slopes. The presence of spruce, twinflower, wild sarsaparilla, rough-leaved ricegrass, or common mitrewort distinguishes these from zonal and drier sites.

06 Fd - Ricegrass - Feathermoss Site Series includes sites only slightly more moist than zonal sites. They occur at the base of short slopes where seepage volumes are small and infrequent, and in shallow depressions on level to gently sloping areas. The forest canopy is moderately closed and, as a result, the density of stems in tree regeneration layers is usually less than on zonal sites. The undergrowth is typically dominated by prickly rose, rough-leaved ricegrass, twinflower, and pinegrass. Mosses cover most of the soil surface.

07 Fd - Prickly rose - Sarsaparilla Site Series includes moist sites only slightly wetter than /06 sites. They occur primarily at the base of longer north-facing slopes where seepage water is present following spring snowmelt and after heavy summer rains but not during most of the growing season. The Douglas-fir–dominated forest canopy is moderately closed and often contains paper birch. The sparse to moderately dense tree regeneration is primarily Douglas-fir, often with some paper birch. The undergrowth is characterized by a moderate density of shrubs and several moist-site forbs. The abundance of Douglas maple, northern gooseberry, violets, and wild sarsaparilla distinguishes these sites from the /06 site series.

08 Sxw - Snowberry - Prickly rose Site Series occurs on moist to wet, lower and toe slope sites that receive seepage water during most of the growing season. They are often associated with intermittent or permanent streams. The forest canopy is moderately closed and dominated by hybrid white spruce. The undergrowth includes a moderate cover of shrubs, including common snowberry and black twinberry, and several moist- to wet-site forbs such as twinflower, star-flowered false Solomon's-seal, and sweet-scented bedstraw. The moss layer is dominated by red-stemmed feathermoss and step moss but, in contrast to drier sites, leafy mosses are also present.

09 Sxw - Horsetail Site Series includes the wettest forested sites of the IDFxm. They occur at the toe of slopes and in depressions where a water table is near the surface. These sites often occur at the edge of non-forested wetlands and on low terraces of larger streams. The forest canopy is dominated by hybrid white spruce and is often patchy. The undergrowth is shrubby and contains several moist- to wet-site herbaceous species such as common horsetail, common mitrewort, and trailing raspberry. Abundant horsetail distinguishes the vegetation of these sites.

Non-forested Sites Grasslands are common and often extensive in the IDFxm. On gently sloping mesic sites, these grasslands are dominated by porcupine grass and spreading needlegrass. On cool north aspects and near the forest edge, spreading needlegrass is dominant. Bluebunch wheatgrass is abundant on gently to steeply sloping south and west aspects. Wetlands are generally uncommon on the IDFxm landscape due to the dry climate and prevalence of sloping terrain but are locally common on Becher's Prairie, an area of gently sloping terrain near the upper elevation limits of the IDFxm. Marshes and shallow open water are the most common wetland type. The IDFxm also includes numerous bedrock cliffs, gravel and silt cliffs, talus slopes, and associated features characteristic of incised valley terrain.

Key to Site Units of the IDFxm

1a. Moisture regime mesic or drier; bluebunch wheatgrass, spike-like goldenrod, common juniper, or cladonia lichens present; hybrid white spruce, paper birch, sweet-scented bedstraw, common mitrewort, black twinberry, rough-leaved ricegrass, and horsetails absent.

2a. Soils <30 cm over bedrock, bedrock usually exposed; slope position crest or upper.

IDFxm/02 Fd - Bluebunch wheatgrass - Penstemon; /02b Shallow Phase

2b. Soils deeper, bedrock not exposed, slope position generally upper to depression or level.

3a. Slope aspect SE, S, SW, or W **and** slope gradient >25%; feathermosses usually absent.

5a. Soil texture sand or loamy sand; shrubby penstemon usually present and pasture sage absent.

IDFxm/02 Fd - Bluebunch wheatgrass - Penstemon; /02a Typic Phase

5b. Soil texture not sand; pasture sage usually present and shrubby penstemon absent.

IDFxm/04 Fd - Bluebunch wheatgrass - Pasture sage

3b Slope aspect NW, N, NE, or E **or** slope gradient <25%; feathermosses usually present.

4a. Slope >35% **and** slope aspect NW, N, NE, or E; feathermosses, especially step moss and red-stemmed feathermoss, have combined cover >50%.

IDFxm/05 Fd - Feathermoss - Step moss

4b. Slope gradient <35%, slope aspect various; feathermoss combined cover generally <50%.

6a. Soil texture sand or loamy sand; kinnikinnick cover >15%; forest canopy dominated by lodgepole pine; showy aster and red-stemmed feathermoss absent or incidental.
IDFxm/03 Fd - Juniper - Cladonia

6b. Soil texture not sand or loamy sand; kinnikinnick cover usually <5%; forest canopy dominated by Douglas-fir or infrequently by lodgepole pine; showy aster and red-stemmed feathermoss present.

7a. Forest canopy dominated by Douglas-fir; cold air drained from site.
IDFxm/01 Fd - Pinegrass - Feathermoss;
/01a Typic Phase

7b. Forest canopy dominated by lodgepole pine; site in cold air accumulation area or on level to very gently sloping area with poor cold air drainage.
IDFxm/01 Fd - Pinegrass - Feathermoss;
/01b Cold Phase

1b. Moisture regime subhygric or wetter; hybrid white spruce, paper birch, sweet-scented bedstraw, common mitrewort, black twinberry, rough-leaved ricegrass, or horsetails usually present; bluebunch wheatgrass, spike-like goldenrod, common juniper, and cladonia lichens usually absent.

7a. Soils not prominently mottled or gleyed, and persistent seepage water or water table not present within 1m of surface; common horsetail, black twinberry, and star-flowered false Solomon's-seal absent.

8a. Douglas maple and rough-fruited fairybells present; field pussytoes and sweet-scented bedstraw absent; sites generally at base of long north- or east-facing slopes.
IDFxm/07 Fd - Prickly rose - Sarsaparilla

8b. Douglas maple and rough-fruited fairybells absent; field pussytoes and sweet-scented bedstraw present; sites generally at base of short slopes or in shallow depressions on level or mid slope positions.

IDFxm/06 Fd - Ricegrass - Feathermoss

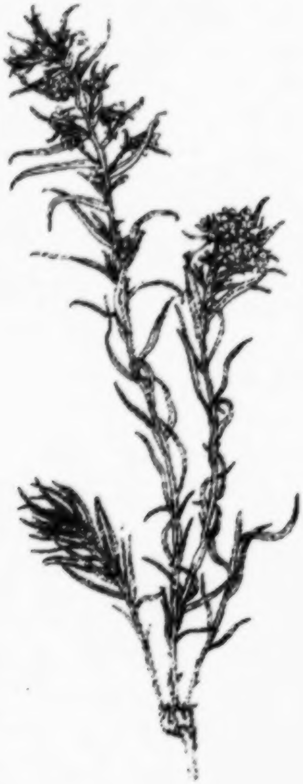
7b. Soils prominently mottled or gleyed, and free water persistent within 100 cm of surface; common horsetail, black twinberry, or star-flowered false Solomon's-seal present.

9a. Common horsetail sparse (<5% cover); slope position mostly lower or toe; water table generally not present within 50 cm of surface; often adjacent to streams.

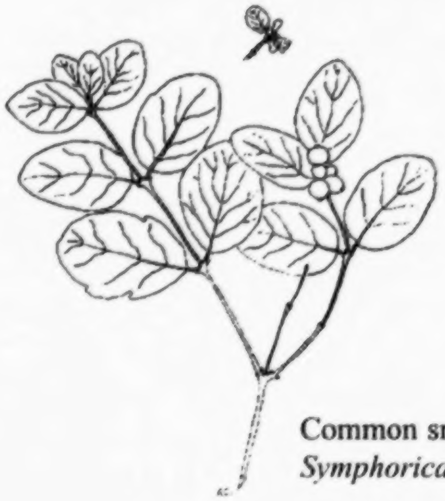
IDFxm/08 Sxw - Snowberry - Prickly rose

9b. Common horsetail cover usually >20%; slope position mostly toe or depression; water table often present within 50 cm of surface.

IDFxm/09 Sxw - Horsetail

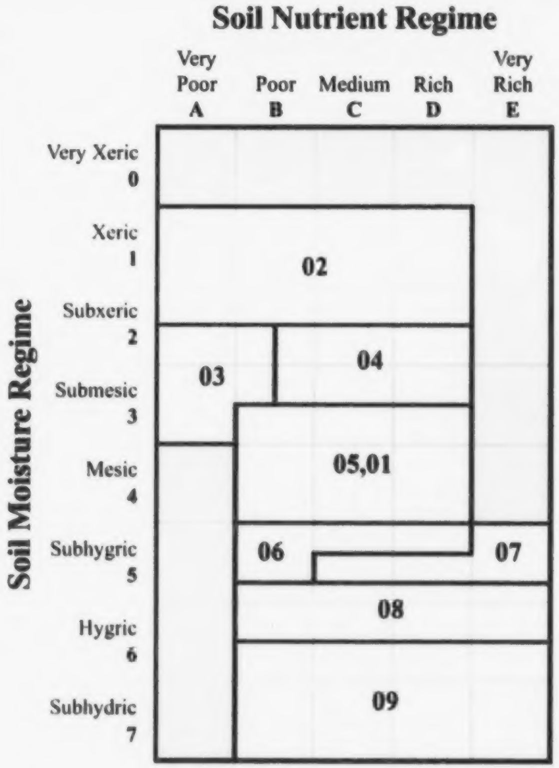


Lemonweed
Lithospermum ruderale



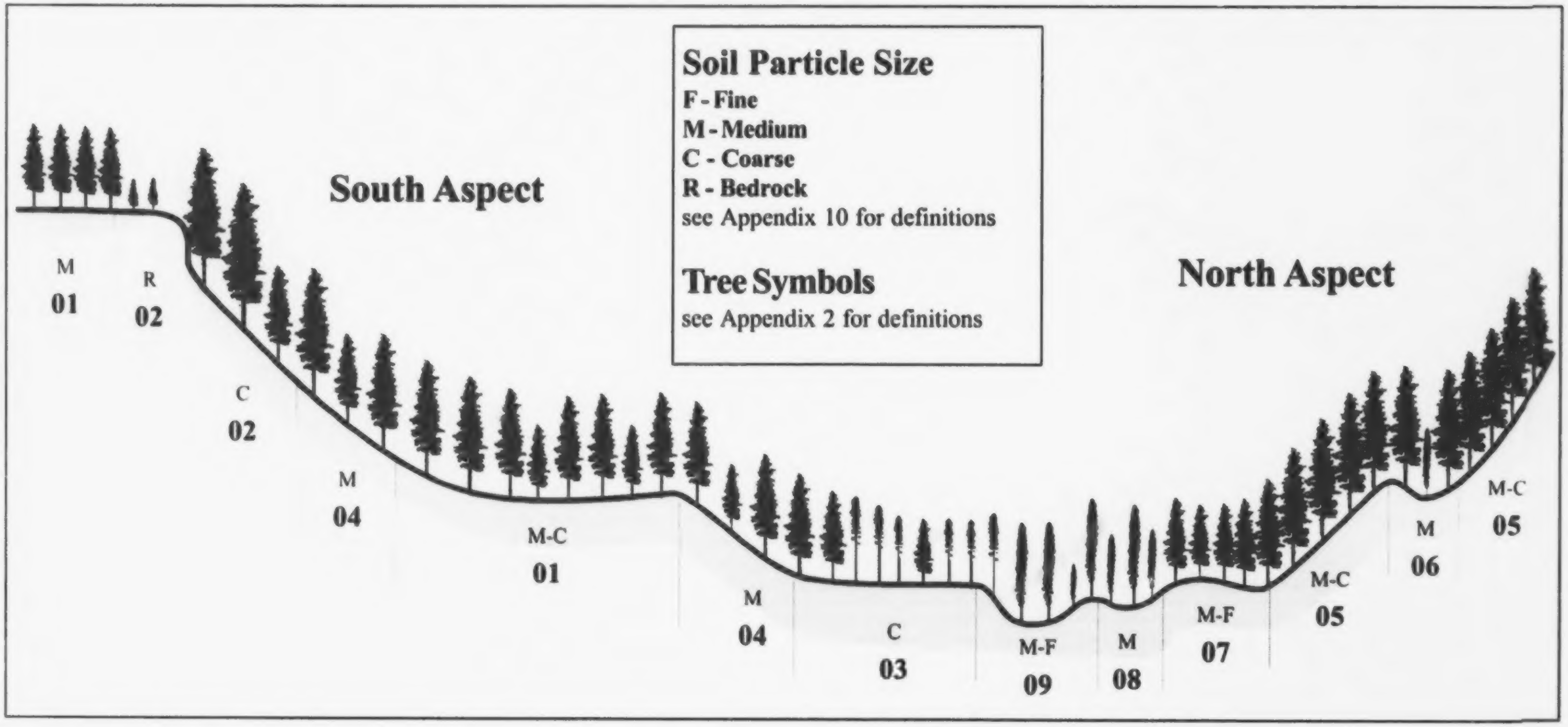
Common snowberry
Symphoricarpos albus

IDFxm Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05,01
06
07
08
09

Site	Series
01	Fd - Pinegrass - Feathermoss
02	Fd - Bluebunch wheatgrass - Penstemon
03	Fd - Juniper - Cladonia
04	Fd - Bluebunch wheatgrass - Pasture sage
05	Fd - Feathermoss - Step moss
06	Fd - Ricegrass - Feathermoss
07	Fd - Prickly rose - Sarsaparilla
08	Sxw - Snowberry - Prickly rose
09	Sxw - Horsetail

IDFxm Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M
01
R
02
C
02
M
04
M-C
01
M
04
C
03
M-F
09
M
08
M-F
07
M-C
05
M
06
M-C
05

Site Features of IDFxm Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other mesic and near-mesic sites on level sites, gentle S to W aspects and gentle to steep N to E aspects	moderate to steep SE- to W- facing slopes with sandy soils; also shallow (< 50 cm) soils over bedrock on crests and upper slopes	level to gentle slopes with sandy, gravelly soils; usually on glaciofluvial terraces	moderate to steep SE-, S-, SW-, and W-facing slopes with loamy, silty, or clayey soils	steep (> 35%) NW, N, NE, or E slope aspects; soils variable
Soil Moisture / Nutrient Regimes	submesic, mesic / poor - rich	xeric, subxeric / very poor - rich	subxeric, submesic / very poor, poor	subxeric, submesic / poor - rich	submesic, mesic / poor - rich
Slope Position	mid, level	crest, upper, mid	level, mid, toe	upper, mid	upper, mid, lower
Aspect	all	all on thin soils; SE - W on deep soils	none	SE, S, SW, or W	NW, N, NE, E
Slope Grade (%)	0 - 35 (generally not > 20 on south aspects)	0 - 15 on thin soils; > 25 on deep soils	0 - 10	> 25	> 35
Soil Texture	loamy	loamy	gravelly sandy	loamy	mostly loamy
Humus Form and Thickness (cm)	Mormoder, Rhizomull 2 - 5	Rhizomull, Xeromoder 0 - 4	Hemimor, Xeromor 0 - 4	Xeromor, Rhizomull 0 - 2	Hemimor 2 - 5
Occurrence / Size /Distribution	very common / medium / wide	common / small / wide	uncommon / small / wide	common / moderate / wide	common / moderate / wide

Site Features of IDFxm Site Series (continued)

Site Series	06	07	08	09
Key Features	lower slope sites and small, shallow depressions at the base of short slopes; soils not gleyed or prominently mottled	moist lower and toe slope positions at the base of N- or E-facing slopes; evidence of intermittent seepage	moist to wet sites receiving seepage during most of growing season; free water within 100 cm of surface; often adjacent to stream channel	wet toe slope positions and depressions; free water usually present within 50 cm of surface during growing season
Soil Moisture / Nutrient Regimes	subhygric / poor - rich	subhygric / medium - very rich	subhygric, hygric / poor - very rich	hygric, subhydric / poor - very rich
Slope Position	lower, depression	lower, toe	lower, toe	toe, depression
Aspect	all, but mostly NW, N, NE, or E	NW, N, NE, E	all but mostly NW, N, NE, or E	none
Slope Grade (%)	0 - 20	0 - 60	0 - 5 (25)	0 - 5
Soil Texture	mostly loamy	loamy	loamy, sandy, or silty	loamy, silty, or organic
Humus Form and Thickness (cm)	Hemimor 2 - 6	Hemimor, Mormoder 3 - 6	Hemimor, Mormoder 5 - 12	Hemimor, Hydromor 8 - 40
Occurrence / Size / Distribution	uncommon / small / wide	uncommon / small / wide	common / small / wide	uncommon / small / wide

IDFxm Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	09	
Tree Layer	*Pinus contorta*		▮▮▮▮								lodgepole pine
	Pseudotsuga menziesii	▮▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮			Douglas-fir
	Betula papyrifera							▮▮▮▮			paper birch
	Picea engelmannii x *glauca*						▮▮		▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub Layer	*Juniperus scopulorum*	▮▮▮	▮	▮▮▮	▮	▮					Rocky Mountain juniper
	Juniperus communis	▮	▮▮▮	▮	▮						common juniper
	Amelanchier alnifolia	▮▮	▮	▮		▮	▮▮	▮▮▮			saskatoon
	Spiraea betulifolia				▮▮▮	▮		▮▮▮			birch-leaved spirea
	Rosa acicularis	▮▮	▮▮▮	▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	prickly rose
	Symphoricarpos albus	▮▮		▮▮▮	▮	▮▮▮	▮▮	▮▮▮	▮▮▮	▮	common snowberry
	Mahonia aquifolium						▮▮	▮▮▮			tall Oregon-grape
	Lonicera involucrata								▮▮▮	▮▮▮	black twinberry
	Cornus stolonifera								▮	▮▮▮	red-osier dogwood
Herb Layer	*Penstemon fruticosus*	▮▮	▮								shrubby penstemon
	Solidago spathulata	▮▮	▮▮	▮▮		▮					spike-like goldenrod
	Elymus spicatus	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	▮					bluebunch wheatgrass
	Allium cernuum		▮▮	▮▮	▮	▮					nodding onion
	Stipa richardsonii		▮▮▮			▮					spreading needlegrass
	Arctostaphylos uva-ursi		▮▮▮▮▮		▮	▮▮▮	▮▮				kinnikinnick
	Calamagrostis rubescens		▮		▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	▮		pinegrass
	Lithspermum ruderale			▮▮		▮					lemonweed
	Heuchera cylindrica				▮▮						round-leaved alumroot
	Aster conspicuus				▮▮▮	▮▮▮		▮▮▮			showy aster
	Aster ciliolatus			▮		▮	▮▮	▮▮	▮▮▮	▮▮▮	fringed aster
	Disporum trachycarpum				▮			▮▮▮			rough-fruited fairybells
	Aralia nudicaulis						▮▮	▮▮▮			wild sarsaparilla
	Oryzopsis asperifolia						▮▮▮▮▮	▮▮▮			rough-leaved ricegrass
	Linnaea borealis						▮▮▮		▮▮▮▮	▮▮▮	twinflower
	Mitella nuda						▮▮		▮	▮▮	common mitrewort
	Smilacina stellata								▮▮	▮▮▮	star-flowered false Solomon's-seal
	Rubus pubescens								▮	▮▮▮	trailing raspberry
	Equisetum arvense								▮▮	▮▮▮▮▮	common horsetail
Moss Layer	*Tortula ruralis*	▮▮▮		▮▮▮							sidewalk moss
	Cladonia spp.	▮▮▮	▮▮▮▮	▮		▮▮▮					cladonia lichens
	Peltigera spp.	▮	▮▮▮▮	▮▮	▮▮▮	▮▮▮	▮▮	▮▮	▮		pelt lichens
	Dicranum polysetum				▮	▮▮▮	▮▮▮				wavy-leaved moss
	Pleurozium schreberi				▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮	▮	red-stemmed feathermoss
	Hylocomium splendens				▮▮▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	▮	step moss
	Brachythecium spp.						▮▮▮		▮	▮	ragged mosses
	Mnium spp.								▮▮▮	▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

IDFxw
INTERIOR DOUGLAS-FIR VERY DRY WARM SUBZONE

The IDFxw is a small subzone (approximately 362 km^2) that occurs in the Bonaparte River and Loon Lake valleys and in the Fraser River valley south of Big Bar. Most of the subzone is within the Cariboo Forest Region. Elevations are generally 600–1000 m.

Distinguishing Adjacent Units from the IDFxw

The **IDFdk3** occurs at higher elevations on the plateau surrounding the Bonaparte River and Loon Lake valleys and on the slopes of the Edge Hills. The **BGxh3** occurs at elevations below the IDFxw in the Fraser River valley along the west side of the Edge Hills.

In the **IDFdk3**, zonal sites have:
- lodgepole pine;
- twinflower;
- no bluebunch wheatgrass or ponderosa pine.

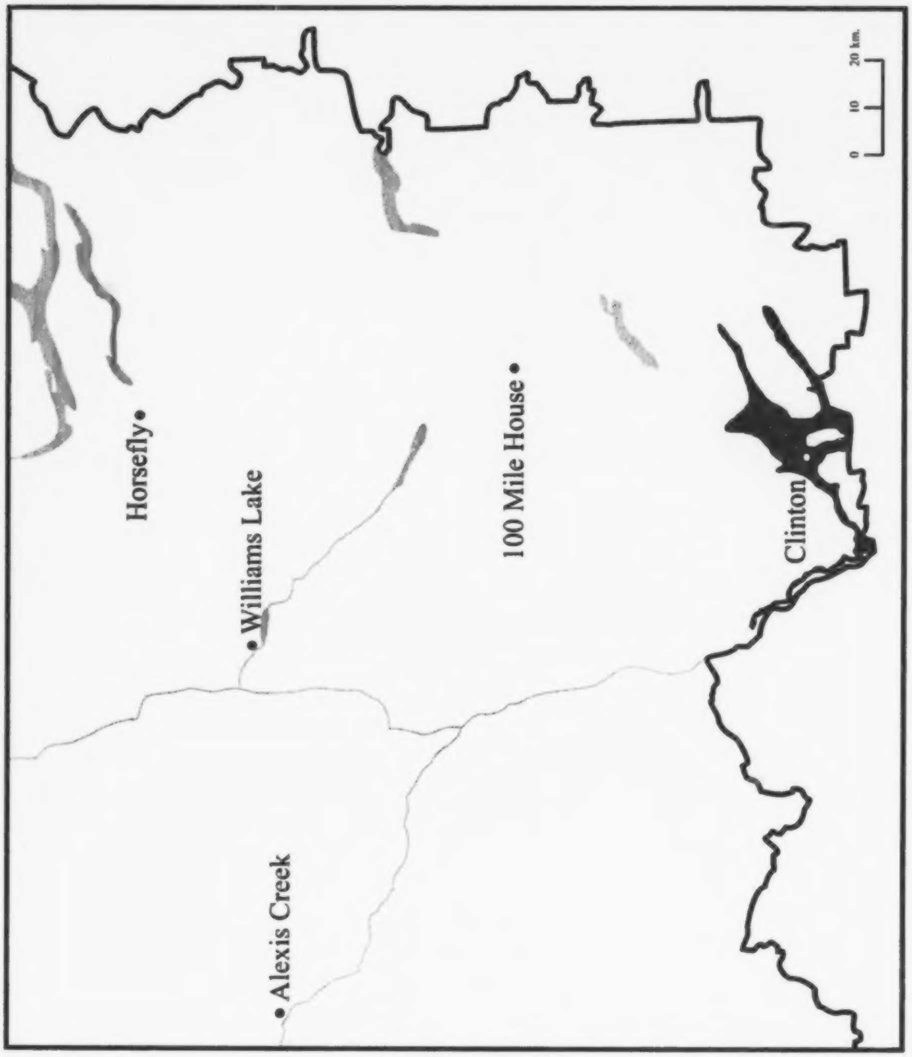
In the **BGxh3**, zonal sites have:
- grasslands, not forests, as climax vegetation;
- no pinegrass.

Site Units of the IDFxw

Zonal Site Series **01 Fd - Juniper - Bluebunch wheatgrass Site Series** dominates the IDFxw, occupying about 40% of the landscape. Slopes are generally level to gentle but are occasionally moderate to steep. They are vegetated by Douglas-fir forests, often with a minor component of ponderosa pine. Small trembling aspen stands occur locally. The Douglas-fir stands typically have a moderately open canopy and relatively sparse tree regeneration, primarily Douglas-fir. The undergrowth is dominated by grasses, primarily pinegrass and bluebunch wheatgrass, and includes few shrubs.

Drier Sites Due to the abundance of steep slopes associated with valley terrain of the IDFxw, sites drier than zonal sites are common. They occur on moderate to steep slopes and on ridge crests and bedrock

Distribution of IDFxw Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
100 Mile House
Alexis Creek
Clinton
0
10
20 km.

outcrops. Coarse-textured soils are not common. On south aspects, slopes with a gradient greater than about 15% are generally drier than mesic. Dry-site forests typically have a relatively open canopy, which commonly includes scattered ponderosa pine The undergrowth includes several dryland vascular species such as compact selaginella, large-fruited desert-parsley, and round-leaved alumroot. Bluebunch wheatgrass is often abundant.

02 FdPy - Bluebunch wheatgrass - Pinegrass Site Series occurs on localized bedrock outcrops on hill crests and upper slope positions. Soils are generally less than 30 cm deep over bedrock. The forest canopy is typically very open and dominated by Douglas-fir or ponderosa pine. The undergrowth is low-growing and dominated by grasses and other dryland vascular plants and lichens. Common species are compact selaginella, bluebunch wheatgrass, pinegrass, Rocky Mountain fescue, and cladonia lichens.

03 FdPy - Western snowberry - Bluebunch wheatgrass Site Series occurs on very steep (>50%) south- or west-facing slopes. These are among the hottest and driest forested sites in the Cariboo Forest Region. The forest canopy is open and consists primarily of Douglas-fir and ponderosa pine, often growing in patches separated by open areas. Trees are short and growth is slow. The undergrowth includes relatively few species and a high proportion of exposed mineral soil. The undergrowth is dominated by bluebunch wheatgrass and rabbit-brush.

04 FdPy - Bluebunch wheatgrass - Balsamroot Site Series occurs on south and west-facing slopes which are moderate to steep (20–50%) but not as steep as those of IDFxw/03. These are also hot, dry sites. The forest canopy is open and dominated by Douglas-fir and ponderosa pine. Tree regeneration is sparse. The undergrowth includes a greater number of species and has less exposed mineral soil than the /03 site series. It is dominated by grasses (primarily bluebunch wheatgrass) and other dryland species including arrow-leaved balsamroot, lemonweed, and kinnikinnick.

05 Fd - Feathermoss Site Series occurs on very steep (>50%) north- and northeast-facing slopes. They are relatively uncommon and mostly small. The forest canopy is moderately closed and dominated entirely by Douglas-fir. The undergrowth is distinguished by a continuous and relatively thick carpet of mosses, primarily red-stemmed feathermoss and step moss, but few vascular plants.

Wetter Sites Sites wetter than mesic occupy a relatively small portion of the IDFxw landscape. They occur primarily along stream channels and as narrow bands on lower slopes and depressions near lakes and small wetlands. Seepage slopes are uncommon due to the low seepage volumes in this dry climate. Hybrid white spruce, red-osier dogwood, northern gooseberry, wild sarsaparilla, palmate coltsfoot, and twinflower are among the characteristic species.

06 Sxw - Water birch Site Series occurs on moist lower slopes and seepage-receiving sites, often adjacent to stream channels or wet depressions. Free seepage water is intermittently present near the soil surface, especially in early spring and following heavy rains, but a water table does not occur within 100 cm of the surface. The forest canopy is moderately closed to open and patchy. It consists primarily of hybrid white spruce and scattered large Douglas-fir. The undergrowth is relatively shrubby and includes prickly rose, northern gooseberry, and water birch. Moist-site forbs such as wild sarsaparilla and star-flowered false Solomon's-seal are common. These sites are generally small.

07 Sxw - Prickly rose - Coltsfoot Site Series occurs on wet toe slope sites and depressions where a water table is present within 100 cm of the surface throughout the growing season. These sites are very small and uncommon. The forest canopy is moderately open and dominated by hybrid white spruce and scattered large Douglas-fir. The undergrowth is shrubby and contains red-osier dogwood, black twinberry, and highbush-cranberry in addition to wet-site herbaceous species such as common horsetail, palmate coltsfoot, and common mitrewort.

Non-forested Sites Most of the IDFxw landscape is forested. However, small grasslands occur on dry south-facing slopes, and small wetlands are common in valley bottoms, often in association with streams and lakes. The grasslands are dominated primarily by bluebunch wheatgrass and rabbit-brush. The wetlands are primarily marshes, shallow open water, and swamps. Moist to dry saline meadows often occur between the wetlands and the upslope forests.

Key to Site Units of the IDFxw

1a. Moisture regime mesic or drier; hybrid white spruce, twinflower, and star-flowered false Solomon's-seal absent; no evidence of persistent seepage inputs.

  2a. Soils very shallow (<25 cm), bedrock near or at surface; slope position crest; moisture regime xeric; muttongrass and compact selaginella present.
  IDFxw/02 FdPy - Bluebunch wheatgrass - Pinegrass

  2b. Soils deeper, and bedrock not at or near surface; slope position various; moisture regime subxeric to mesic; muttongrass and compact selaginella usually absent.

    3a. Slope aspect SE, S, SW, or W.

      4a. Slope gradient >50%; soil parent material colluvium; mineral soil exposure >50%; moisture regime subxeric; rabbit-brush present.
      IDFxw/03 FdPy - Western snowberry - Bluebunch wheatgrass

      4b. Slope gradient <50%; soil parent material not colluvium; mineral soil exposure generally <20%; rabbit-brush absent (occasionally very low amounts in IDFxw/01).

        5a. Pinegrass absent; slope gradient generally 20–50%.
        IDFxw/04 FdPy - Bluebunch wheatgrass - Balsam root

        5b. Pinegrass present; slope gradient generally <20% (rarely to 40%).
        IDFxw/01 Fd - Juniper - Bluebunch wheatgrass

    3b. Slope aspect NW, N, NE, or E.

6a. Slope gradient >50% **and** slope aspect N or NE.
IDFxw/05 Fd - Feathermoss

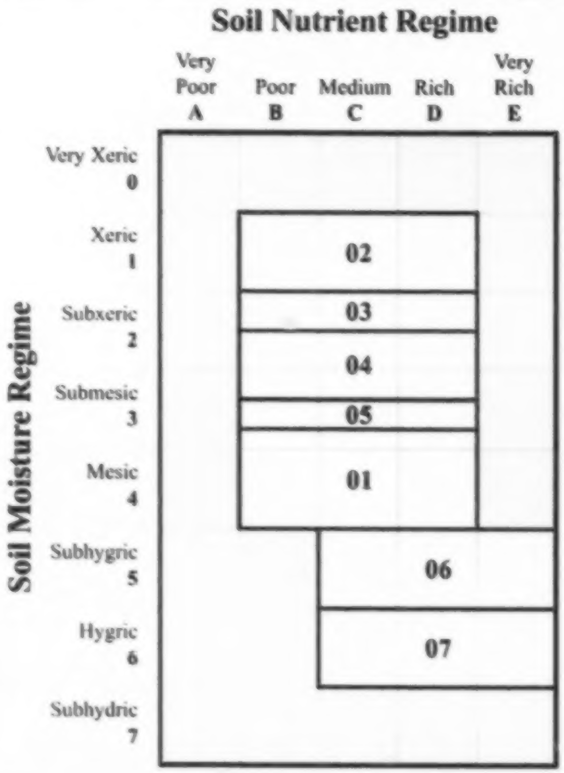
6b. Slope gradient <50% or, if steeper, then slope aspect not N or NE.
IDFxw/01 Fd - Juniper - Bluebunch wheatgrass

1b. Moisture regime subhygric or wetter; hybrid white spruce, twinflower, or star-flowered false Solomon's-seal present; evidence of significant seepage inputs present.

7a. Moisture regime subhygric; slope grade usually >10%; water table generally not within 100 cm of surface; water birch and western meadowrue present; highbush-cranberry, common horsetail, meadow horsetail, and palmate coltsfoot absent or incidental.
IDFxw/06 Sxw - Water birch

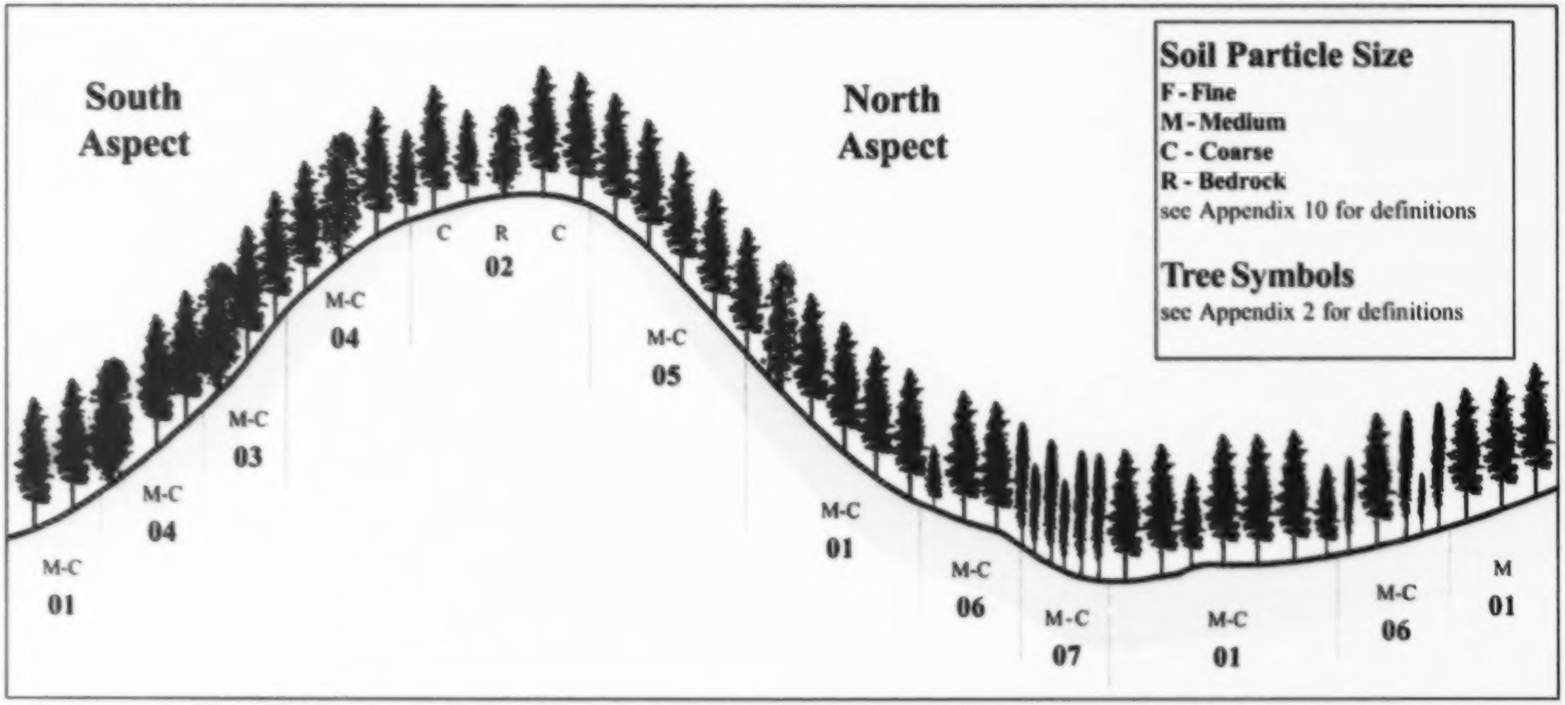
7b. Moisture regime hygric or subhydric; slope grade usually <10%; water table present within 100 cm of surface; water birch and western meadowrue absent or incidental; highbush-cranberry, common horsetail, meadow horsetail, and palmate coltsfoot present.
IDFxw/07 Sxw - Prickly rose - Coltsfoot

IDFxw Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
01
06
07

Site Series	
01	Fd - Juniper - Bluebunch wheatgrass
02	FdPy - Bluebunch wheatgrass - Pinegrass
03	FdPy - Western snowberry - Bluebunch wheatgrass
04	FdPy - Bluebunch wheatgrass - Balsamroot
05	Fd - Feathermoss
06	Sxw - Water birch
07	Sxw - Prickly rose - Coltsfoot

IDFxw Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M-C 01
M-C 04
M-C 03
M-C 04
C R C 02
M-C 05
M-C 01
M-C 06
M-C 07
M-C 01
M-C 06
M 01

Site Features of IDFxw Site Series

Site Series	01	02	03	04
Key Features	zonal and other mesic or submesic sites on gentle, warm slopes and gentle to steep, cool slopes	very shallow (< 25 cm) soils over bedrock on upper and crest slope positions	very steep (> 50%) SE- to W-facing slopes; very hot, dry sites with ravelling soils	moderate to steep (20 - 50%) SE- to W-facing slopes; hot, dry sites
Soil Moisture / Nutrient Regimes	mesic (submesic) / poor - rich	xeric / poor - rich	subxeric / poor - rich	subxeric, submesic / poor - rich
Slope Position	mid, level, lower	crest, upper	upper, mid	upper, mid
Aspect	all	all	SE, S, SW, W	SE, S, SW, W
Slope Grade (%)	0 - 60 (> 20 only on cool aspects)	0 - 15	50 - 75	20 - 50
Soil Texture	gravelly loamy	loamy with near-surface bedrock	gravelly loamy	gravelly loamy
Humus Form and Thickness (cm)	Mormoder, Rhizomull 1 - 5	Rhizomull, Xeromoder 0 - 4	Rhizomull 0 - 3	Rhizomull, Mormoder 1 - 3
Occurrence / Size / Distribution	very common / medium / wide	common / small / wide	uncommon / small / wide	common / medium / wide

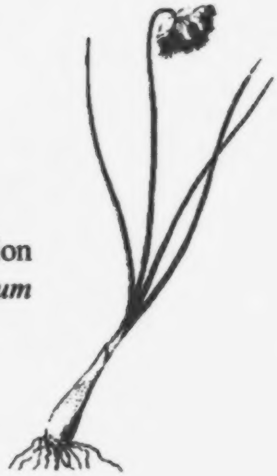
Site Features of IDFxw Site Series (continued)

Site Series	05	06	07
Key Features	steep (> 50%) NE- and N-facing slopes	moist lower slopes without water table within 100 cm; seepage intermittent; often riparian	wet toe slope positions and depressions with water table within 100 cm of surface
Soil Moisture / Nutrient Regimes	submesic / poor - rich	subhygric / medium - very rich	hygric / medium - very rich
Slope Position	upper, mid	lower	toe, depression
Aspect	N, NE, NW, E	all (predominantly NW, N, NE, E)	all
Slope Grade (%)	50 - 70	10 - 60	0 - 5
Soil Texture	gravelly loamy	loamy, sandy	loamy, sandy
Humus Form and Thickness (cm)	Mormoder 2 - 5	Mormoder 1 - 12	Hemimor and Hydromor 1 - 15
Occurrence / Size / Distribution	uncommon / small / wide	uncommon / small / wide	common / small / wide

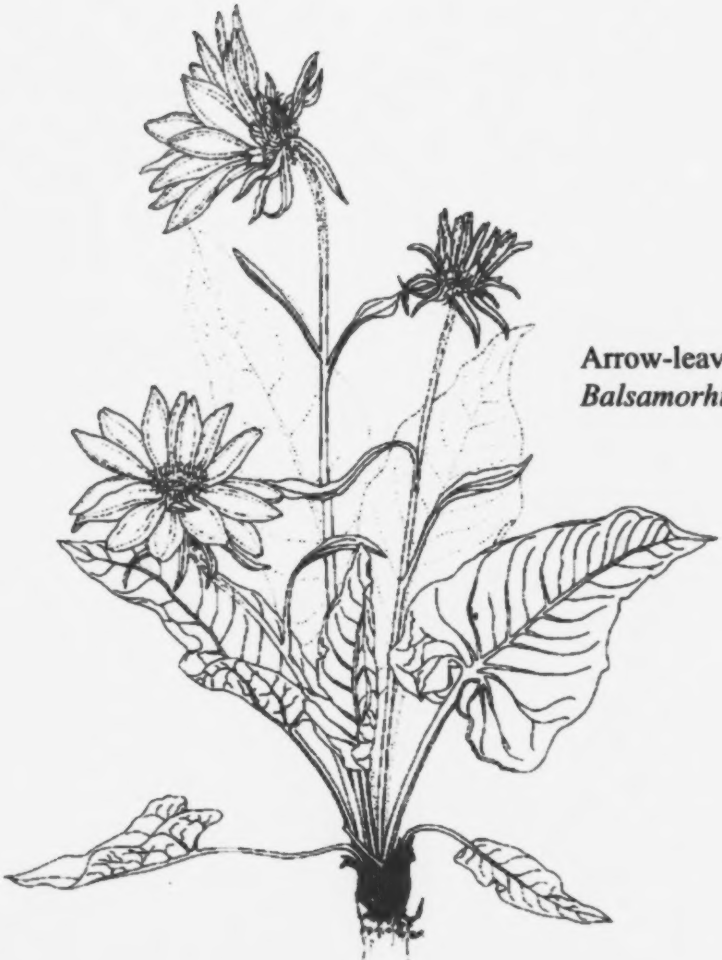
IDFxw Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	
Tree	*Pinus ponderosa*	▮	▮▮▮	▮▮▮▮		▮▮▮			ponderosa pine
Layer	*Pseudotsuga menziesii*	▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮	▮	Douglas-fir
	Picea engelmannii x glauca						▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub	*Juniperus scopulorum*	▮▮▮	▮	▮▮▮	▮	▮▮▮	▮		Rocky Mountain juniper
Layer	*Rosa acicularis*	▮▮	▮			▮▮	▮▮▮	▮▮▮▮	prickly rose
	Chrysothamnus nauseosus		▮▮▮						rabbit-brush
	Shepherdia canadensis			▮		▮▮▮	▮▮		soopolallie
	Betula occidentalis						▮▮▮		water birch
	Ribes oxyacanthoides						▮▮	▮	northern gooseberry
	Cornus stolonifera						▮	▮▮▮	red-osier dogwood
	Lonicera involucrata						▮	▮▮▮	black twinberry
	Viburnum edule							▮▮	highbush-cranberry
Herb	*Selaginella densa*	▮▮▮▮							compact selaginella
Layer	*Festuca saximontana*	▮▮▮		▮					Rocky Mountain fescue
	Lomatium macrocarpum	▮▮	▮	▮▮					large-fruited desert-parsley
	Penstemon fruticosus	▮▮		▮▮					shrubby penstemon
	Heuchera cylindrica	▮▮			▮				round-leaved alumroot
	Arctostaphylos uva-ursi	▮▮▮		▮▮▮		▮▮▮▮			kinnikinnick
	Allium cernuum	▮▮		▮▮	▮	▮▮			nodding onion
	Lithspermum ruderale		▮▮	▮		▮			lemonweed
	Elymus spicatus	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮	▮▮▮▮▮			bluebunch wheatgrass
	Balsamorhiza saggittata	▮		▮▮▮		▮▮▮			arrow-leaved balsamroot
	Achillea millefolium	▮▮		▮▮	▮▮	▮▮	▮▮		yarrow
	Calamagrostis rubescens	▮▮▮			▮▮▮▮▮	▮▮▮▮▮		▮▮	pinegrass
	Astragalus miser				▮	▮▮			timber milk-vetch
	Linnaea borealis						▮▮▮	▮▮▮▮▮	twinflower
	Smilacina stellata						▮▮	▮▮	star-flowered false Solomon's-seal
	Geocaulon lividum						▮▮▮	▮	bastard toad-flax
	Aralia nudicaulis						▮	▮▮	wild sarsaparilla
	Orthilia secunda						▮	▮▮	one-sided wintergreen
	Pyrola asarifolia						▮	▮▮▮	pink wintergreen
	Equisetum arvense							▮▮	common horsetail
	Mitella nuda							▮▮	common mitrewort
	Petasites palmatus							▮▮▮	palmate coltsfoot
Moss	*Ceratodon purpureus*	▮▮	▮						fire moss
Layer	*Peltigera rufescens*	▮▮▮				▮			felt pelt
	Cladonia/Cladina spp.	▮▮▮				▮▮▮			cladonia lichens/reindeer lichens
	Hylocomium splendens				▮▮▮▮▮		▮	▮	step moss
	Pleurozium schreberi				▮▮▮▮▮		▮	▮▮▮▮▮	red-stemmed feathermoss
	Eurhynchium pulchellum						▮	▮▮	

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Nodding onion
Allium cernuum



Arrow-leaved balsamroot
Balsamorhiza sagittata

MHmm2
MOUNTAIN HEMLOCK
MOIST MARITIME SUBZONE
LEEWARD VARIANT

The MHmm2 includes a small area (approx. 109 km^2) of the Cariboo Forest Region at moderate to high elevations in the lower Mosley Creek valley and the Homathko River valley. In the Homathko River valley, it occurs downstream of the confluence with Mosley Creek to the border with the Vancouver Forest Region. Elevations are predominantly 1200–1550 m. The MHmm2 is much more extensive in the Vancouver and Prince Rupert forest regions.

Distinguishing Adjacent Units from the MHmm2
(Cariboo Forest Region only)

The **CWH** Zone (CWHms1 and possibly CWHds1) occurs below the MHmm2, and the **AT** Zone occurs at higher elevations. The **ESSFxv** quickly replaces the MHmm2 at high elevations of the Homathko River and Mosley Creek valleys as the coastal influence diminishes upstream into the Cariboo Forest Region.

In the **CWH**, zonal sites have:
- Douglas-fir and redcedar;
- more abundant western hemlock;
- little or no mountain hemlock.

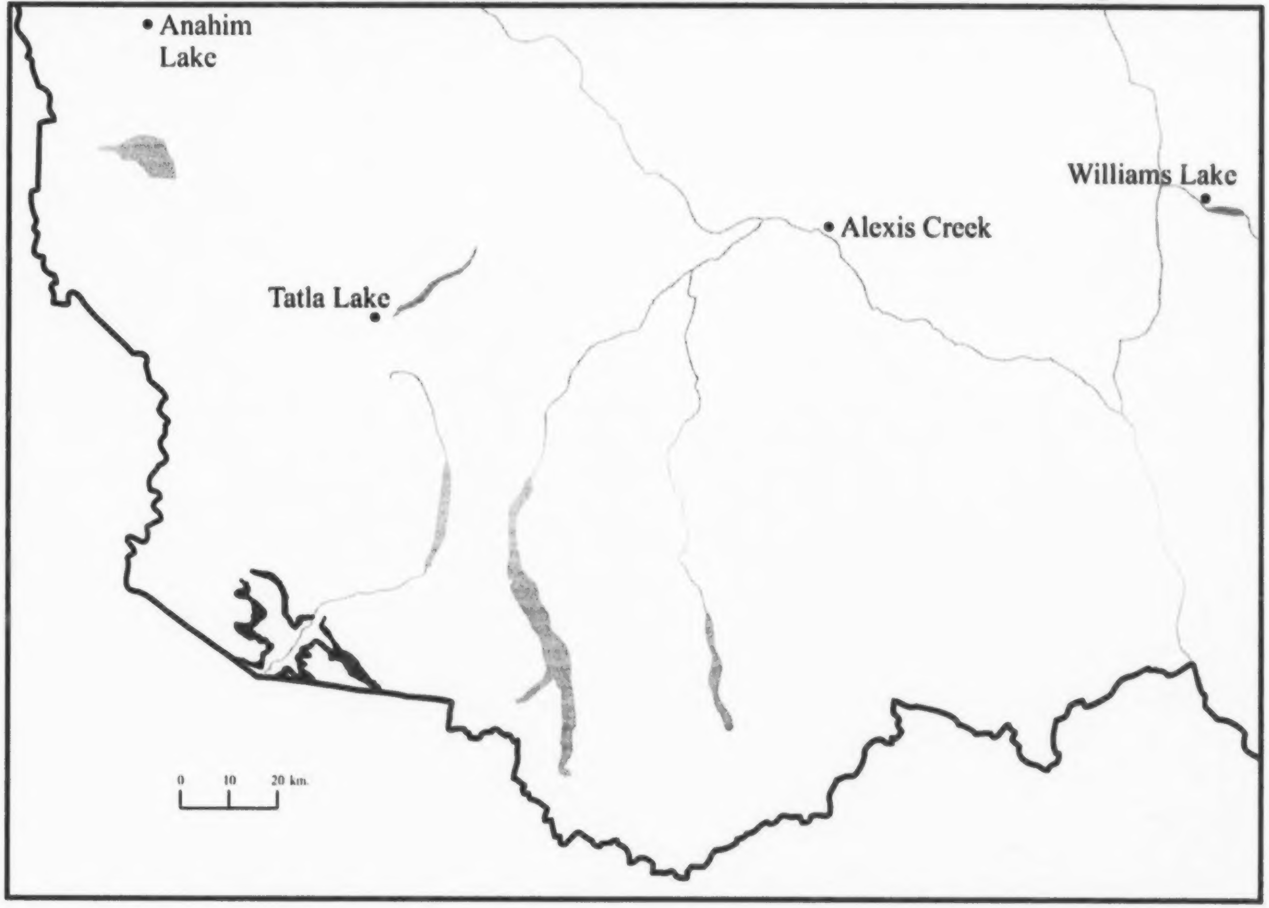
In the **AT** (and parkland), zonal sites have:
- predominantly non-forest (meadow, shrubland, etc.) vegetation;
- trees rarely more than 8 m tall.

In the **ESSFxv**, zonal sites have:
- grouseberry and cladonia lichens;
- more common subalpine fir, Engelmann spruce, and grouseberry
- little or no amabilis fir or mountain hemlock.

Site Units of the MHmm2

Site units of the MHmm2 have been described for the Vancouver Forest Region by Green and Klinka (1994). Separate classifications have not been prepared for the Cariboo Forest Region nor has the Vancouver Region classification been tested in the Cariboo Forest Region. However, it is anticipated that the Vancouver Region classification is generally applicable to the Cariboo Forest Region.

Distribution of MHmm2 Variant in the Cariboo Forest Region


Anahim Lake
Tatla Lake
Alexis Creek
Williams Lake
0
10
20 km.

MSdc2
MONTANE SPRUCE
DRY COLD SUBZONE
TATLAYOKO VARIANT

The MSdc2 is a very small variant that occurs on leeward slopes of the Pacific Ranges and northwestern parts of the Chilcotin Range. Specifically it occurs in the valleys of Chilko and Tatlayoko lakes, Mosley Creek, and Klinaklini and Atnarko rivers. It occurs at elevations above the IDFdw and below the ESSFxv, primarily from 1150 to 1650 m (occasionally to 1750 m).

Distinguishing Adjacent Units from the MSdc2

The **ESSFxv** occurs at elevations above the MSdc2 throughout its distribution. On slopes facing onto the Fraser Plateau, the MSdc2 is replaced at similar elevations by the **MSxv**, which has a colder, drier climate. In the Coast Mountains east of Chilko Lake, it is replaced at similar elevations by the **MSdv**. The **IDFdw** occurs below the MSdc2 on lower slopes of major valleys.

In the **MSxv**, zonal sites have:
- hybrid white spruce, grouseberry, crowberry, and common juniper;
- little or no subalpine fir in overstory.

dry sites have:
- no Douglas-fir.

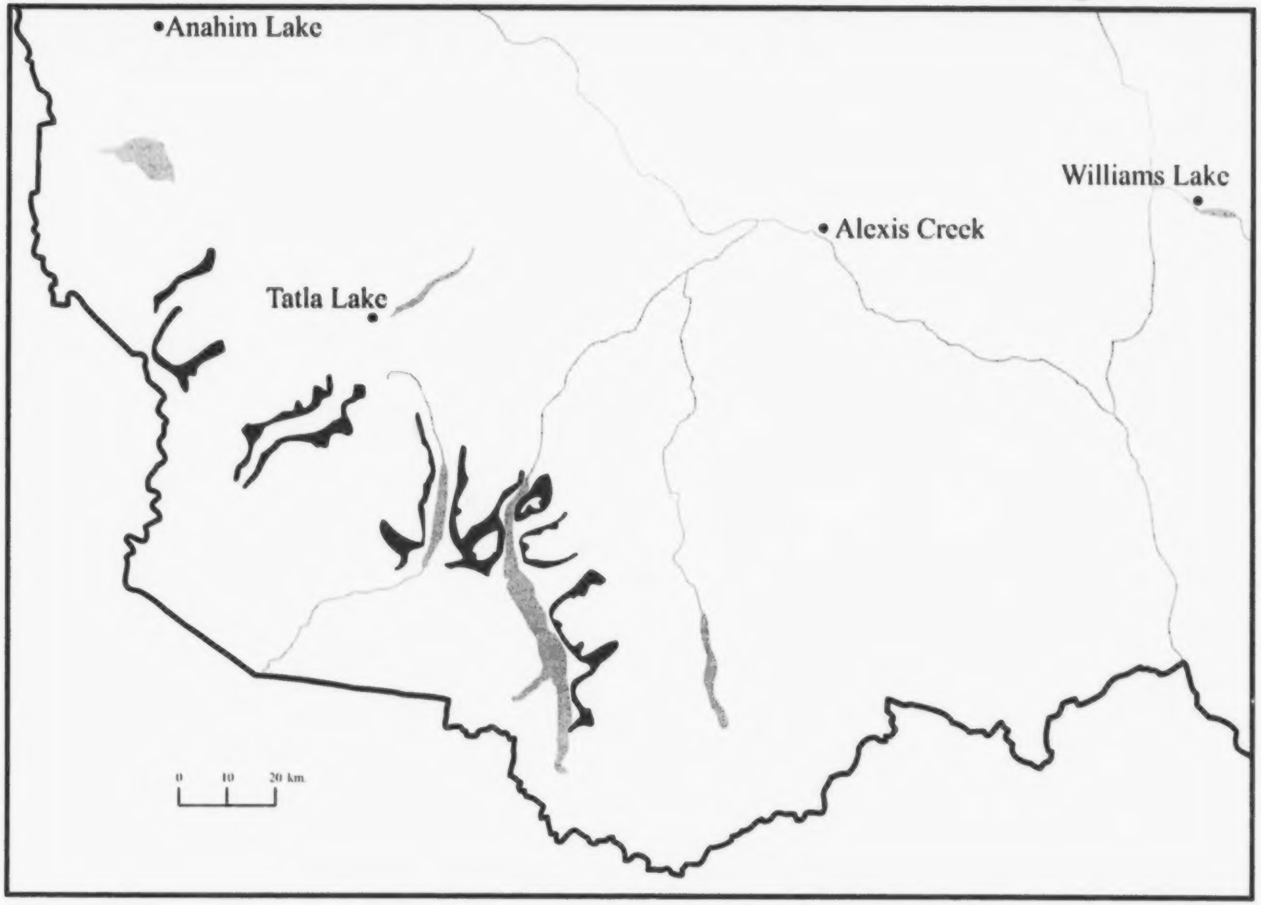
In the **MSdv**, zonal sites have:
- abundant arctic lupine, pinegrass, soopolallie, and showy aster;
- uncommon subalpine fir.

dry sites have:
- no Douglas-fir.

In the **IDFdw**, zonal sites have:
- common Douglas-fir;
- showy aster and pinegrass.

In the **ESSFxv**, zonal sites have:
- white-flowered rhododendron, bracted lousewort, grouseberry, and arctic lupine.

Distribution of MSdc2 Variant in the Cariboo Forest Region


•Anahim Lake
Tatla Lake
• Alexis Creek
Williams Lake
0
10
20 km.

Site Units of the MSdc2

Due to access constraints, fewer ecosystem inventory data are available for the MSdc2 than for most other biogeoclimatic units in the Cariboo Forest Region. In addition, the MSdc2 encompasses significant local climatic variability resulting from varying coastal influence from valley to valley. As a result, the probability of encountering undescribed forested ecosystems and variations from the described units is generally greater in this than in most other biogeoclimatic units.

Zonal Site Series **01 Sxw - Wintergreen - Feathermoss Site Series** is the predominant site unit in the MSdc2. It occupies gentle to moderately steep upper to lower slopes on all aspects. Soils are mostly Orthic Dystric Brunisols. The climax forest canopy is dominated by subalpine fir and hybrid white spruce but, due to a history of frequent wildfires, most stands are seral stages dominated by lodgepole pine and subalpine fir. A few Douglas-fir are often present. Tree regeneration is predominantly subalpine fir together with lesser numbers of hybrid white spruce. The undergrowth vegetation consists of many species, which together form a low to moderate overall cover. Common shrubs are soopolallie, Sitka alder, and birch-leaved spirea. The herb layer usually contains twinflower, heart-leaved arnica, one-sided wintergreen, and bunchberry. Moss cover is variable.

Drier Sites Sites drier than the zonal site series occur on hill crests, steep slopes, south- and west-facing slopes, and coarse soils. They are moderately common. Compared to zonal or other mesic sites they frequently have significant amounts of Douglas-fir in both the forest canopy and tree regeneration layers. Common juniper, saskatoon, kinnikinnick, and pinegrass are also usually present.

02 FdBl - Spirea - Stonecrop Site Series occurs on moderate to steep upper slopes and ridge tops where bedrock is near (<50 cm) the surface. Soils are mostly loamy, but often contain high amounts of coarse fragments. These are generally small, localized sites. The vegetation is distinguished by dominant Douglas-fir with an undergrowth containing several dry-site species, including common juniper, saskatoon, shrubby penstemon, kinnikinnick, pinegrass, lance-leaved stonecrop, and ground lichens.

03 FdBl - Soopolallie - Kinnikinnick Site Series occurs primarily on moderate to steep south- and west-facing slopes with deep, loamy soils that have a high coarse fragment content. It also occurs on gentler south- and west-facing slopes where soils are shallow (<80 cm). The forest canopy is typically dominated by Douglas-fir and lodgepole pine. Tree regeneration is predominantly Douglas-fir and subalpine fir. The shrub layer is poorly to moderately well developed and usually contains prickly rose, soopolallie, saskatoon, common juniper, and faslebox. The undergrowth is distinguished from other dry sites by the greater abundance of falsebox, showy aster, western meadowrue, and pinegrass, and by the absence of shrubby penstemon and lance-leaved stonecrop.

04 PlBl - Soopolallie - Kinnikinnick Site Series has been recorded only south of Charlotte Lake in an area that appears to be transitional to the MSxv. It occurs on moderately dry, gentle to moderate slopes in areas of relatively low relief. The forest canopy is predominantly lodgepole pine and subalpine fir. The understory is dominated by subalpine fir but often contains scattered hybrid white spruce. Scattered whitebark pine are frequently present. The shrub layer is typically dense and dominated by soopolallie and occasionally Sitka alder. The herb layer contains few species other than kinnikinnick and occasional bunchberry. Lichens and dicranum mosses have moderate cover. The lack of Douglas-fir, pinegrass, and showy aster and the abundance of lodgepole pine and subalpine fir distinguishes these sites from those of the /03 site series.

Wetter Sites Sites wetter than those of the zonal site series are moderately common in the MSdc2. They occur on lower slopes in the bottoms of small valleys, on seepage areas, and along streams and wetlands. Compared to the zonal site series, they have less lodgepole pine, soopolallie, pinegrass, and lichens, and more hybrid white spruce, black twinberry, palmate coltsfoot, and pink wintergreen.

05 Sxw - Rhododendron - Crowberry Site Series occurs on moist, intermittent-seepage sites where cold air accumulates, primarily on toe slope positions and in small, shallow depressions within cold air drainage tracts. The mature forest canopy is moderately closed and dominated by hybrid white spruce and subalpine fir. Tree regeneration is sparse to moderately abundant and predominantly subalpine fir. The undergrowth vegetation is distinguished by cold-site species such as white-flowered rhododendron, Labrador tea, and crowberry, in addition to moist-site species such as black twinberry, palmate coltsfoot, common horsetail, and clasping twistedstalk.

06 Sxw - Twinberry - Reedgrass Site Series occurs on moist toe slope positions and flats with silty or clayey soils. The mature forest canopy consists of relatively open-grown hybrid white spruce and scattered subalpine fir. Hybrid white spruce is typically the principal species of tree regeneration. The undergrowth vegetation in mature stands is distinguished by a relatively well-developed shrub layer of black twinberry, mountain alder, and black gooseberry and a well-developed herb layer containing bluejoint, star-flowered false Solomon's-seal, and trailing raspberry.

07 Sxw - Gooseberry Site Series occurs on north- and east-facing slopes on mid, lower, and toe slope positions where soils are moistened by intermittent to permanent seepage. It often occurs along streams and where subsurface seepage is near the surface on valley slopes. The mature forest canopy is dominated by hybrid white spruce and subalpine fir with scattered lodgepole pine. Tree regeneration is predominantly subalpine fir. The undergrowth vegetation is distinguished from the /01 site series by the presence of black gooseberry and black twinberry as well as forbs indicative of moist sites.

08 Sxw - Horsetail - Leafy moss Site Series occurs on level or gently sloping sites with a near-surface (<50 cm) water table, primarily at the toe of slopes. Soils are typically Gleysols and less commonly Organics. The mature forest canopy is predominantly hybrid white spruce with a few scattered subalpine fir. Trees are often rooted on raised microsites. The undergrowth is distinguished by >25% cover of common horsetail. Other distinguishing herbs include soft-leaved sedge, palmate coltsfoot, and fringed grass-of-Parnassus. Glow moss, leafy mosses, and occasionally sphagnum moss are also present.

Non-forested Sites Wetlands are not abundant in the MSdv2 and are primarily small fens in local depressions and swamps along small streams. Grasslands are relatively rare in the MSdv2 and occur as grass- and shrub-dominated "balds" on steep south aspects. Sites dominated by bedrock with sparse vegetation are relatively common on steeply sloping valley sides.

Key to Site Units of the MSdc2

1a. Soils <50 cm deep over bedrock; bedrock outcrops often present; slope position crest or upper; moisture regime very xeric to subxeric.
MSdc2/02 FdBl - Spirea - Stonecrop

1b. Soils deeper; bedrock outcrops usually absent; slope position not crest except on subdued hills; moisture regime subxeric or wetter.

  2a. Slope gradient >30%.

    3a. Slope aspect SE, S, SW, or W; moisture regime subxeric or submesic; slope position upper or mid; tree layers dominated by Douglas-fir; subalpine fir usually not abundant in tree layers; pinegrass, kinnikinnick, and soopolallie usually present.
    MSdc2/03 FdBl - Soopolallie - Kinnikinnick

    3b. Slope aspect NW, N, NE, or E; moisture regime predominantly mesic or submesic; Douglas-fir absent or cover low; subalpine fir often well represented in canopy; pinegrass, kinnikinnick, and soopolallie absent or incidental.
    MSdc2/01 Sxw - Wintergreen - Feathermoss

  2b. Slope gradient <30%.

    4a. Moisture regime submesic or mesic; slope position mid (rarely lower); no evidence of seepage within 50 cm of soil surface; black twinberry, palmate coltsfoot, and common horsetail absent or incidental.

      5a. Moisture regime submesic; cover of kinnikinnick and cladonia lichens each >5%.

        6a. Douglas-fir and pinegrass cover each >5%.
        MSdc2/03 FdBl - Soopolallie - Kinnikinnick

        6b. Douglas-fir and pinegrass absent or incidental.
        MSdc2/04 PlBl - Soopolallie - Kinnikinnick

      5b. Moisture regime mesic or occasionally submesic; kinnikinnick and cladonia lichens absent or incidental (<1% cover).
      MSdc2/01 Sxw - Wintergreen - Feathermoss

4b. Moisture regime subhygric to subhydric; slope position predominantly lower, toe, depression, or level; evidence of seepage water or water table within 1 m of soil surface; black twinberry, coltsfoot, or common horsetail usually present.

7a. Common horsetail abundant (cover generally >35%); soft-leaved sedge and glow moss common.
MSdc2/08 Sxw - Horsetail - Leafy moss

7b. Common horsetail not abundant (cover generally <5%); soft-leaved sedge and glow moss usually absent or incidental.

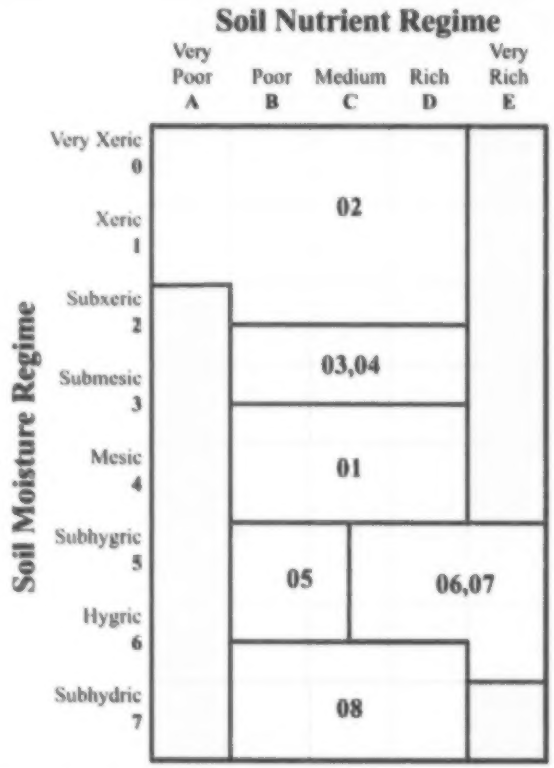
8a. White-flowered rhododendron, crowberry, and grouseberry common.
MSdc2/05 Sxw - Rhododendron - Crowberry

8b. White-flowered rhododendron, crowberry, and grouseberry absent or incidental.

9a. Mountain alder and showy aster present.
MSdc2/06 Sxw - Twinberry - Reedgrass

9b. Mountain alder and showy aster absent or incidental.
MSdc2/07 Sxw - Gooseberry

MSdc2 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03,04
01
05
06,07
08

Site Series

01	Sxw - Wintergreen - Feathermoss
02	FdB1 - Spirea - Stonecrop
03	FdB1 - Soopolallie - Kinnikinnick
04	P1B1 - Soopolallie - Kinnikinnick
05	Sxw - Rhododendron - Crowberry
06	Sxw - Twinberry - Reedgrass
07	Sxw - Gooseberry
08	Sxw - Horsetail - Leafy moss

Site Features of MSdc2 Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently sloping sites with mesic or near-mesic moisture regime	very dry ridge crests and upper slopes with thin soils (< 50 cm) over bedrock	moderate to steep SE, S, SW, and W aspects; soils often have abundant coarse fragments	moderately dry, gently to moderately sloping mid slope positions; soils often sandy
Soil Moisture / Nutrient Regimes	mesic, submesic / poor - rich	very xeric - subxeric / very poor - rich	subxeric, submesic / poor - rich	subxeric, submesic / poor - rich
Slope Position	mid (upper - lower)	crest, upper	upper, mid	mid (lower)
Aspect	all	all	SE, S, SW, W	all
Slope Grade (%)	0 - 30 (rarely to 65)	0 - 80	10 - 70	5 - 25
Soil Texture	gravelly loamy, sand, silty	gravelly loamy, silty	gravelly loamy, silty	gravelly loamy, sandy
Humus Form	Hemimor	Xeromor, Xeromoder	Hemihumimor, Mormoder	Mormoder, Humimor, Leptomoder
Occurrence / Size/ Distribution	common / medium - large / wide	uncommon / small / wide	common / medium / wide	common / medium - large / Charlotte Lake area

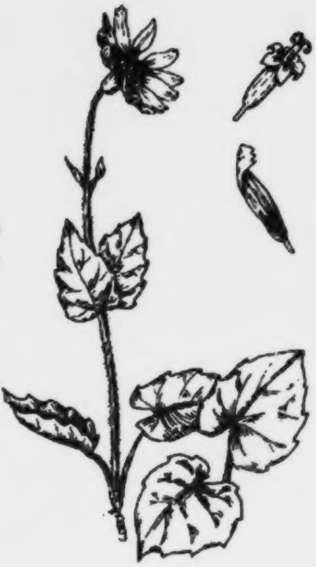
Site Features of MSdc2 Site Series (continued)

Site Series	05	06	07	08
Key Features	moist toe slope positions and shallow depressions with significant cold air accumulation	moist lower and toe slope positions with alluvial or lacustrine soils; often adjacent to streams	moist mid, lower, and toe slope sites with evidence of seepage in predominantly morainal soils	toe slope positions and depressions with near-surface (< 50 cm) water table
Soil Moisture / Nutrient Regimes	subhygric, hygric / poor, medium	subhygric, hygric / medium - very rich	subhygric, hygric / medium - very rich	hygric - subhydric / poor - rich
Slope Position	lower, toe, shallow depression	lower, toe, level	mid, lower, toe	lower, toe, depression
Aspect	mostly NW, N, NE, E	none	NW, N, NE, E	mostly NW, N, NE, E
Slope Grade (%)	0 - 15	< 5	5 - 50	0 - 10
Soil Texture	silty, clayey, organic	silty, clayey	silty, clayey, (organic)	silty, clayey, organic
Humus Form	Histomor, Hemihumimor, Saprimull	Hydromor	Hemihumimor, Saprimull	Hydromor, Histomoder
Occurrence / Size / Distribution	uncommon / small / wide	uncommon / small / known from Chesi Creek area	common / small, medium / wide	uncommon / small / wide

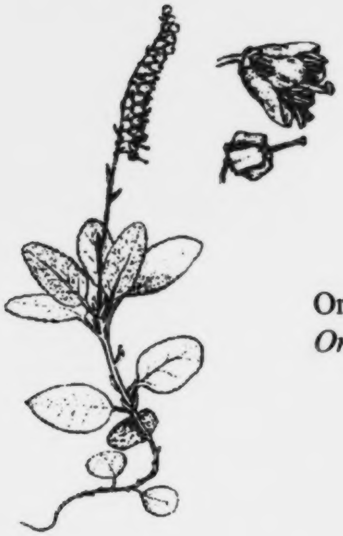
MSdc2 Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	
Tree Layer	*Pinus contorta*	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮			▮		lodgepole pine
	Pseudotsuga menziesii	▮▮▮▮	▮▮▮▮▮							Douglas-fir
	Abies lasiocarpa			▮▮▮▮	▮▮▮▮	▮▮▮▮	▮	▮▮▮▮	▮	subalpine fir
	Picea engelmannii x *glauca*			▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub Layer	*Amelanchier alnifolia*	▮▮▮	▮▮							saskatoon
	Juniperus communis	▮▮								common juniper
	Spiraea betulifolia	▮▮▮	▮				▮			birch-leaved spirea
	Shepherdia canadensis		▮▮▮	▮▮▮						soopolallie
	Rosa acicularis	▮▮	▮▮▮			▮▮▮	▮▮▮		▮▮▮	prickly rose
	Vaccinium membranaceum				▮	▮▮▮				black huckleberry
	Rhododendron albiflorum				▮	▮▮▮▮▮		▮	▮	white-flowered rhododendron
	Alnus tenuifolia						▮▮▮▮▮		▮▮▮	mountain alder
	Lonicera involucrata					▮▮▮	▮▮▮▮	▮▮	▮▮	black twinberry
Herb Layer	*Hieracium* spp.	▮▮	▮▮							hawkweeds
	Arctostaphylos uva-ursi	▮▮▮▮	▮▮▮	▮▮▮▮						kinnikinnick
	Calamagrostis rubescens	▮▮▮	▮▮▮▮▮				▮			pinegrass
	Achillea millefolium	▮▮	▮			▮▮				yarrow
	Arnica cordifolia		▮▮▮		▮▮▮	▮▮▮▮	▮	▮		heart-leaved arnica
	Thalictrum occidentale		▮▮▮				▮▮▮	▮▮▮	▮	western meadowrue
	Aster conspicuus		▮▮▮				▮▮▮▮			showy aster
	Vaccinium scoparium					▮▮▮				grouseberry
	Linnaea borealis			▮▮▮▮	▮▮▮	▮▮▮▮	▮	▮	▮▮	twinflower
	Cornus canadensis			▮	▮	▮▮▮	▮▮▮	▮	▮▮▮	bunchberry
	Empetrum nigrum					▮▮▮▮			▮	crowberry
	Petasites palmatus					▮▮▮	▮	▮	▮▮▮	palmate coltsfoot
	Equisetum arvense					▮▮▮	▮		▮▮▮▮▮	common horsetail
	Calamagrostis canadensis						▮▮▮			bluejoint
	Smilacina stellata						▮▮▮▮			star-flowered false Solomon's-seal
	Galium triflorum						▮▮▮	▮	▮	sweet-scented bedstraw
	Streptopus amplexifolius					▮▮			▮	clasping twistedstalk
	Rubus pubescens						▮▮▮		▮	trailing raspberry
	Aster foliaceus								▮▮▮	leafy aster
Moss Layer	*Peltigera* spp.	▮▮▮		▮	▮					pelt lichens
	Dicranum spp.		▮	▮▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮		heron's-bill mosses
	Pleurozium schreberi				▮▮▮▮		▮▮▮▮		▮	red-stemmed feathermoss
	Mnium spp.						▮		▮	leafy mosses
	Aulacomnium palustre								▮▮▮▮▮	glow moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Heart-leaved arnica
Arnica cordifolia



One-sided wintergreen
Orthilia secunda

MSdv
MONTANE SPRUCE
DRY VERY COLD SUBZONE

The MSdv is a very small subzone that occurs around Taseko Lakes and in the adjacent Lord River valley and Yohetta Valley. It extends from valley bottoms to the lower boundary of the ESSFxv. The topography includes moderately sloping valley sides and gently sloping or level valley bottoms. Elevations are primarily 1300–1650 m (occasionally to 1750).

Distinguishing Adjacent Units from the MSdv

The **ESSFxv1** occurs above the MSdv throughout its distribution. At the north end of Taseko Lakes, where the climate is colder and drier, the **MSxv** replaces the MSdv at similar elevations. At the western end of the Yohetta Valley, near Chilko Lake where the climate is apparently warmer, the MSxv is replaced at similar elevations by the **MSdc2**.

In the **ESSFxv1**, zonal sites have:
- white-flowered rhododendron, bracted lousewort, and grouseberry.

In the **MSxv**, zonal sites have:
- grouseberry, crowberry, and common juniper;
- uncommon pinegrass and prickly rose.

In the **MSdc2**, zonal sites have:
- uncommon arctic lupine, pinegrass, soopolallie, and showy aster.

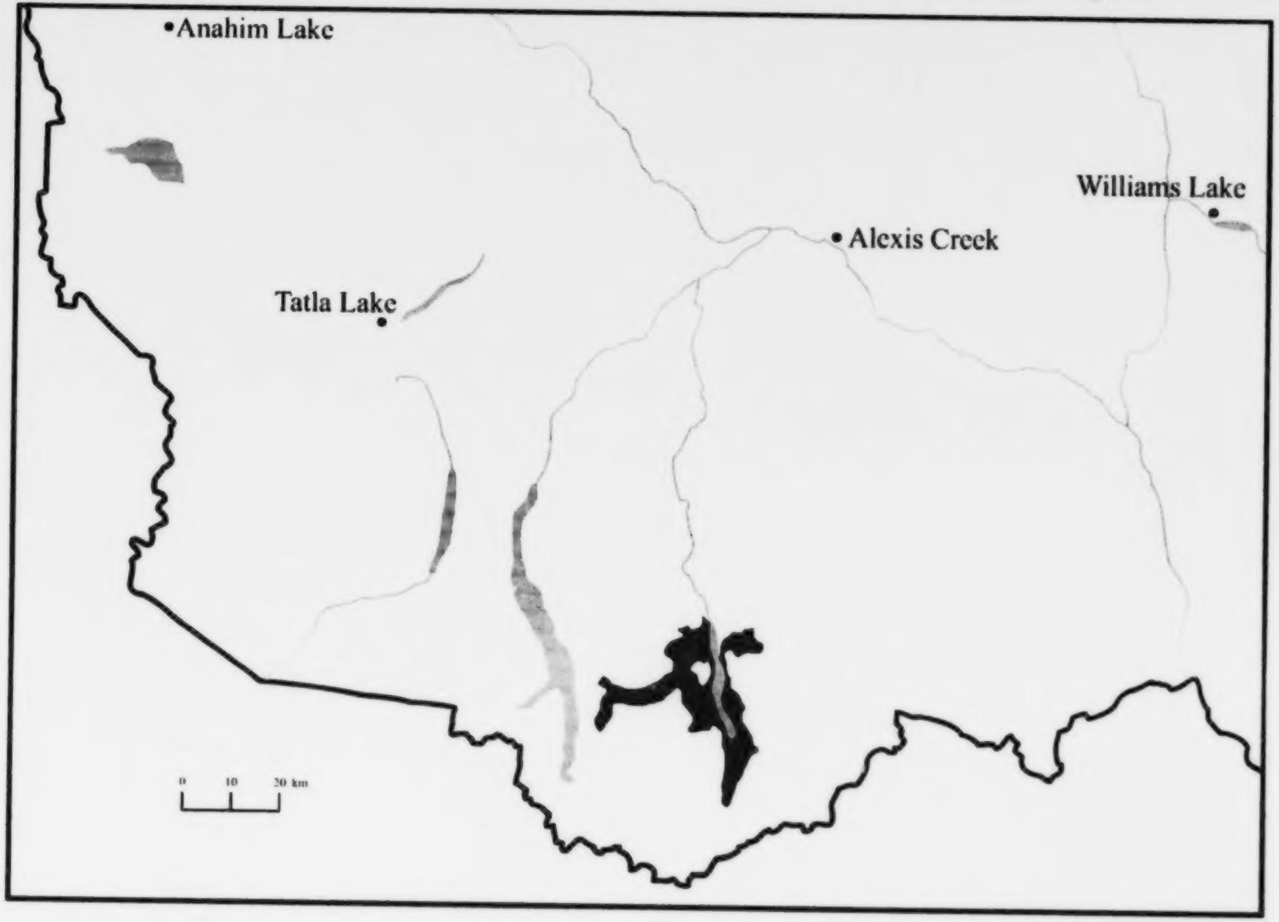
dry sites have:
- Douglas-fir.

Site Units of the MSdv

The following site classification is based on a relatively small ecosystem inventory data base. The probability of encountering undescribed forested ecosystems is generally greater in this than in most other biogeoclimatic units except the MSdc2.

Zonal Site Series **01 Pl - Soopolallie - Twinflower Site Series** is the predominant site unit in the MSdv. It occurs on mid and lower slope positions, primarily on loamy morainal and occasionally on fluvial soil

Distribution of MSdv Subzone in the Cariboo Forest Region


Anahim Lake
Williams Lake
Alexis Creek
Tatla Lake
0
10
20 km

parent materials. The climax forest canopy is dominated by subalpine fir and hybrid white spruce but, due to frequent wildfires, most stands are seral stages dominated by lodgepole pine. In contrast to the MSdc2, Douglas-fir is absent. The undergrowth vegetation has a low to moderate cover of soopolallie and prickly rose and abundant showy aster, pinegrass, and arctic lupine. The /01 is distinguished from wetter sites by the presence of showy aster and pinegrass and from drier sites by the presence of bunchberry.

Drier Sites Sites drier than the zonal site series occur on hill crests, steep slopes, south- and west-facing slopes, soils with high coarse fragment content, and sandy soils. They are moderately common. Compared to zonal or other mesic sites they have more abundant yarrow, kinnikinnick, and falsebox and a higher cover of lichens.

02 Pl - Penstemon - Balsamroot Site Series occurs on moderate to steep SE, S, SW, and W aspects and on ridge tops where bedrock is near (<50 cm) the surface. These sites are generally small. The forest canopy is relatively open and dominated by lodgepole pine. The undergrowth contains several species indicative of dry, warm sites, including saskatoon, shrubby penstemon, kinnikinnick, stonecrop, compact selaginella, and ground lichens.

03 Pl - Short-awned ricegrass - Peltigera Site Series is relatively uncommon but occurs locally on dry, level to gently sloping, sandy soils. It is most common in valley bottoms where cold air accumulates. The mature forest canopy is typically open, and dominated by lodgepole pine. Tree regeneration includes scattered lodgepole pine, spruce, and subalpine fir. The undergrowth vegetation is distinguished from other submesic site series by the presence of streambank butterweed, short-awned ricegrass, and abundant pelt lichens.

04 Pl - Saskatoon - Kinnikinnick Site Series occurs primarily on mid and upper slope positions with sandy or coarse loamy morainal soils. The mature forest canopy is dominated by lodgepole pine. The undergrowth vegetation is distinguished from the /05 site series by abundant kinnikinnick and by the frequent occurrence and greater abundance of saskatoon and wild strawberry. The undergrowth usually contains abundant soopolallie and common juniper, but lesser amounts of western fescue, spike-like goldenrod, and red-stemmed feathermoss than in the /05 site series.

05 Pl - Soopolallie - Heron's bill moss Site Series includes subxeric and submesic sites that have sandy soils, usually with a high coarse fragment content. It occurs on mid to upper slope positions on all slope aspects. The mature forest canopy is dominated by lodgepole pine. The undergrowth vegetation is distinguished from the similar /04 site series by the absence of kinnikinnick, saskatoon, and yarrow.

Wetter Sites Sites wetter than mesic are common at the toe of slopes and adjacent to streams and wetlands, but are generally small. In the relatively dry MSdv climate, wet seepage areas generally have very limited extent. Forests on wet sites are typically dominated by hybrid white spruce and are distinguished by the presence of black twinberry, bunchberry, common horsetail, palmate coltsfoot, or glow moss.

06 Sxw - Twinberry - Reedgrass Site Series includes most forested ecosystems on moist lower slopes. It is common on lower valley slopes and valley bottoms, and along stream channels. Soils are moistened by intermittent seepage and infrequently have faint mottles at depth. The mature forest canopy is moderately closed, and dominated by hybrid white spruce. The undergrowth vegetation is distinguished by moderate cover of black twinberry, common black gooseberry, palmate coltsfoot, and bluejoint. Common horsetail is usually present but not abundant.

07 Sxw - Dwarf blueberry - Crowberry Site Series is uncommon and most sites are small. It typically occurs immediately upslope or at the perimeter of the /09 site series where cold air accumulates and summer frost is frequent. The mature forest canopy is a mixture of lodgepole pine and hybrid white spruce, and the tree regeneration layer includes scattered spruce and subalpine fir. Abundant crowberry distinguishes these sites from other sites wetter than mesic. Other characteristic species include dwarf blueberry, bunchberry, twinflower, and a low cover of common horsetail.

08 Sxw - Soopolallie - Scouring-rush Site Series is uncommon and occurs primarily on toe slope positions. Persistent seepage keeps soils wet for prolonged periods during the growing season and, as a result, soils are usually mottled. The forest canopy is dominated by hybrid white spruce, and the vegetation is distinguished from that of other wet sites by abundant dwarf scouring-rush and golden fuzzy fen moss. Other characteristic species include pink wintergreen, palmate coltsfoot, and black twinberry.

09 Sxw - Horsetail - Leafy moss Site Series includes most forested sites in wet depressions and at the toe of slopes with a near-surface (<50 cm) water table. The forest canopy is dominated by relatively open-grown hybrid white spruce, often rooted on raised microsites. Subalpine fir is commonly present in the subcanopy. The undergrowth vegetation is distinguished by abundant common horsetail.

Non-forested Sites Non-forested wetlands are moderately common in the MSdv but are generally small. Fens, marshes, and swamps are the most common types. Small grasslands occur locally on steep south-facing slopes and often contain species typical of warmer climates. These species include bluebunch wheatgrass, balsamroot, meadow death-camas, and spreading needlegrass.

Key to Site Units of the MSdv

1a. Moisture regime mesic or drier, no evidence of seepage water or water table within 1 m of soil surface; forest canopy dominated by lodgepole pine; spruce absent or minor component (except in 01); pinegrass, kinnikinnick, or showy aster present.

2a. Moisture regime very xeric, xeric, or subxeric; soils shallow (<50 cm) to bedrock or slope gradient >25% **and** slope aspect SE, S, SW, or W (100–280°); balsamroot, bluebunch wheatgrass or stonecrop present.

MSdv/02 Pl - Penstemon - Balsamroot;
/02a Shallow Soil Phase
/02b South Slope Phase

2b. Moisture regime subxeric, submesic, or mesic; soils not shallow to bedrock and sites not steep south- or west-facing (may be steep NW, N, NE, or E); balsamroot, bluebunch wheatgrass, and stonecrop absent.

MSdc2/03 FdBl - Soopolallie - Kinnikinnick

3a. Moisture regime subxeric or submesic; bunchberry and western meadowrue absent or incidental.

4a. Soil parent materials coarse glaciofluvial; short-awned ricegrass and streambank butterweed present; heart-leaved arnica and showy aster absent.

MSdv/03 Pl - Short-awned ricegrass - Peltigera

4b. Soil parent materials coarse morainal or colluvial; short-awned ricegrass and streambank butterweed absent or incidental; heart-leaved arnica or showy aster usually present.

5a. Kinnikinnick abundant (>15% cover), saskatoon often present.

MSdv/04 Pl - Saskatoon - Kinnikinnick

5a. Kinnikinnick not abundant (<15% cover and usually <5% cover), saskatoon absent.

MSdv/05 Pl - Soopolallie - Heron's bill moss

3b. Moisture regime mesic, bunchberry and western meadowrue present.

MSdv/01 Pl - Soopolallie - Twinflower

1b. Moisture regime subhygric or wetter; evidence of seepage water or water table usually present within 1 m of surface; forest canopy dominated by hybrid white spruce; pinegrass, kinnikinnick, and showy aster absent.

6a. Moisture regime subhygric, no evidence of seepage water or water table within 50 cm of surface; common horsetail and glow moss not abundant (<5% cover).

7a. Crowberry and dwarf blueberry present; black gooseberry and bluejoint absent.

MSdv/07 Sxw - Dwarf blueberry - Crowberry

7b. Crowberry and dwarf blueberry absent; black gooseberry and bluejoint present.

MSdv/06 Sxw - Twinberry - Reedgrass

6b. Moisture regime hygric or subhydric, seepage water or water table usually within 50 cm of surface; either common horsetail or glow moss abundant (cover >10%).

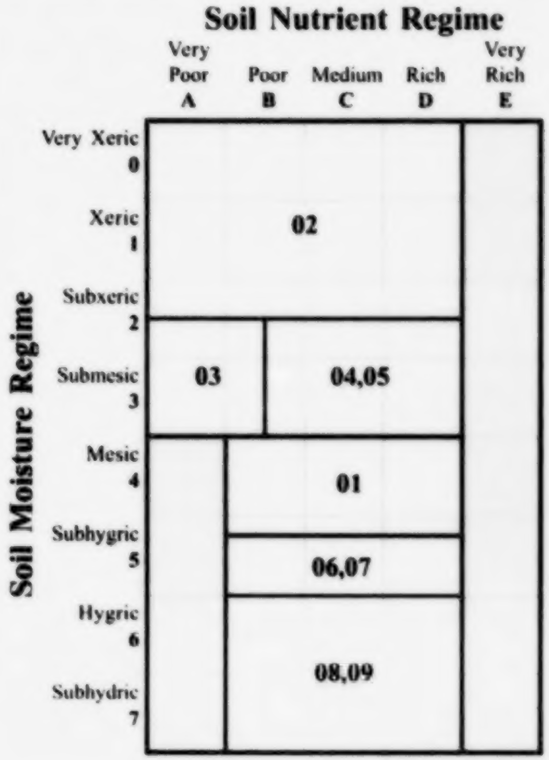
8a. Common horsetail abundant (>20% cover); soopolallie absent or incidental.

MSdv/09 Sxw - Horsetail - Leafy moss

8b. Common horsetail absent or incidental; soopolallie cover >5%.

MSdv/08 Sxw - Soopolallie - Scouring-rush

MSdv Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04,05
01
06,07
08,09

Site Series

01	Pl - Soopolallie - Twinflower
02	Pl - Penstemon - Balsamroot
03	Pl - Short-awned ricegrass - Peltigera
04	Pl - Saskatoon - Kinnikinnick
05	Pl - Soopolallie - Heron's bill moss
06	Sxw - Twinberry - Reedgrass
07	Sxw - Dwarf blueberry - Crowberry
08	Sxw - Soopolallie - Scouring-rush
09	Sxw - Horsetail - Leafy moss

Site Features of MSdv Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	very dry, ridge crests and upper slopes with thin soils (< 50 cm) over bedrock; also upper slope positions on steep SE, S, SW, or W aspects	dry, level and gently sloping sites with sandy soils; soil parent materials mostly glaciofluvial	dry, upper and mid slope positions, soils most often sandy	dry, mid and upper slopes with gravelly sandy soils
Soil Moisture / Nutrient Regimes	mesic (subhygric) / poor - rich	xeric, subxeric / very poor - rich	submesic (subxeric) / very poor, poor	submesic, subxeric / poor - rich	submesic, subxeric / poor - rich
Slope Position	mid (lower)	crest, upper	level (mid)	upper, mid	mid, upper
Aspect	all	SE, S, SW, or W on deep soils and all aspects if soils shallow	all	all	all
Slope Grade (%)	0 - 20	0 - 20 on crest, 20 - 60 on upper slopes	0 - 10	0 - 40	0 - 40
Soil Texture	(gravelly) loamy (sandy)	(gravelly) loamy	gravelly sandy	gravelly sandy and coarse loamy	gravelly sandy
Humus Form	Hemimor, Mormoder	Rhizomull, Xeromoder	Hemimor	Xeromoder, Mormoder	Hemimor, Xeromor
Occurrence / Size / Distribution	predominant / medium - large / wide	uncommon / small / wide	uncommon / medium / wide	common / medium / wide	common / medium / wide

Site Features of MSdv Site Series (continued)

Site Series	06	07	08	09
Key Features	moist, gentle lower slope and toe slope sites, predominantly on N aspects	moist, level and gently sloping sites primarily at the perimeter of wet depressions	level and toe slope positions with near-surface water table or seepage water	depressions and toe slope positions with near-surface water table
Soil Moisture / Nutrient Regimes	subhygric / poor - rich	subhygric / poor - rich	hygric / poor - rich	hygric / poor - rich
Slope Position	lower, toe, level	toe, level	toe, level	toe, depression, level
Aspect	all but predominantly NW, N, NE, and E	all	all	all
Slope Grade (%)	0 - 20	0 - 5	0 - 5	0 - 5
Soil Texture	(gravelly) loamy	loamy	loamy, silty, clayey	loamy, silty
Humus Form	Mormoder, Hemihumimor	Hemimor	Hydromor	Histomor, Hydromor
Occurrence / Size / Distribution	common / medium - small / wide	uncommon / small / unknown	uncommon / small / wide	common / small - medium / wide

MSdv Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	09	
Tree Layer	*Pinus albicaulis*	▮▮▮		▮	▮						whitebark pine
	Pinus contorta	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮			lodgepole pine
	Picea engelmannii x glauca		▮▮			▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub Layer	*Penstemon fruticosus*	▮▮▮									shrubby penstemon
	Amelanchier alnifolia	▮▮▮		▮▮▮							saskatoon
	Juniperus communis		▮▮	▮▮▮		▮		▮▮▮			common juniper
	Shepherdia canadensis	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮		▮▮▮	▮▮▮▮▮		soopolallie
	Pachistima myrsinites	▮▮		▮	▮			▮▮▮			falsebox
	Rosa acicularis	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮▮▮		▮▮	prickly rose
	Abies lasiocarpa		▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮▮▮	subalpine fir
	Lonicera involucrata					▮▮	▮▮▮		▮▮▮	▮▮▮	black twinberry
	Salix spp.								▮▮	▮▮▮	willows
Herb Layer	*Balsamorhiza saggittata*	▮▮▮▮									arrow-leaved balsamroot
	Elymus spicatus	▮▮▮									bluebunch wheatgrass
	Achillea millefolium	▮▮▮	▮▮	▮▮		▮					yarrow
	Calamagrostis rubescens	▮▮▮▮▮	▮▮▮▮			▮▮▮▮					pinegrass
	Oryzopsis pungens		▮▮▮								short-awned ricegrass
	Arctostaphylos uva-ursi	▮▮▮▮	▮▮▮▮	▮▮▮▮▮				▮▮▮			kinnikinnick
	Fragaria virginiana	▮▮▮	▮▮	▮▮▮		▮▮		▮▮▮	▮▮		wild strawberry
	Linnaea borealis		▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮	twinflower
	Aster conspicuus			▮▮▮	▮▮▮	▮▮▮▮					showy aster
	Lupinus arcticus			▮		▮▮▮					arctic lupine
	Arnica cordifolia			▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮		heart-leaved arnica
	Cornus canadensis					▮▮▮	▮▮▮▮	▮▮▮		▮▮▮	bunchberry
	Empetrum nigrum							▮▮▮▮			crowberry
	Calamagrostis canadensis						▮▮▮			▮▮▮	bluejoint
	Equisetum scirpoides								▮▮▮▮		dwarf scouring-rush
	Equisetum arvense						▮▮▮	▮▮		▮▮▮▮▮	common horsetail
	Petasites palmatus						▮▮▮		▮▮	▮▮▮	palmate coltsfoot
Moss Layer	*Cetraria* spp.		▮▮▮								cetraria lichens
	Pleurozium schreberi		▮▮	▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	▮▮			red-stemmed feathermoss
	Peltigera aphthosa		▮▮	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	freckle pelt
	Cladonia spp.		▮▮▮	▮▮▮	▮▮▮	▮		▮▮	▮▮		cladona lichens
	Dicranum spp.		▮▮	▮	▮▮▮▮	▮▮▮	▮▮▮▮		▮▮		heron's-bill mosses
	Brachythecium spp.			▮▮▮		▮	▮▮▮▮			▮▮	ragged mosses
	Aulacomnium palustre					▮		▮▮▮	▮▮▮▮▮	▮▮▮▮▮	glow moss
	Timmia austriaca							▮▮▮			false-polytrichum
	Tomenthypnum nitens								▮▮▮▮		golden fuzzy fen moss
	Mnium spp.									▮▮▮▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

MSxk
MONTANE SPRUCE
VERY DRY COOL SUBZONE

The MSxk occurs primarily in the Kamloops Forest Region as far south as the U.S./Canada border. It has a relatively small area (605 km^2) in the Cariboo Forest Region where it occurs at mid elevations above either the IDFdk or SBPSmk subzones and below either the ESSFxc or ESSFxv subzones. Principal areas of occurrence are mid elevation slopes of the Marble Range and east side of the Camelsfoot Range, upper slopes and hilltops of the Edge Hills, heights-of-land north and south of Bonaparte Lake, and the high plateau around Hihium Lake. Elevations are mostly 1400–1700 m.

Distinguishing Adjacent Units from the MSxk
(Cariboo Forest Region only)

The **SBPSmk** occurs below the MSxk in the vicinity of Bonaparte Lake where elevations of the Fraser Plateau are generally above 1250 m. Throughout the remainder of the MSxk distribution, the **IDFdk** occurs at lower elevations. The **IDFdk3** lies below the MSxk east of the Fraser River (Hihium area, Marble Range, and Edge Hills), while the **IDFdk4** lies below the MSxk west of the Fraser River (Camelsfoot Range). The **ESSFxc** occurs above the MSxk in the Marble Range, while the **ESSFxv** occurs above the MSxk in the colder climates of the Camelsfoot Range.

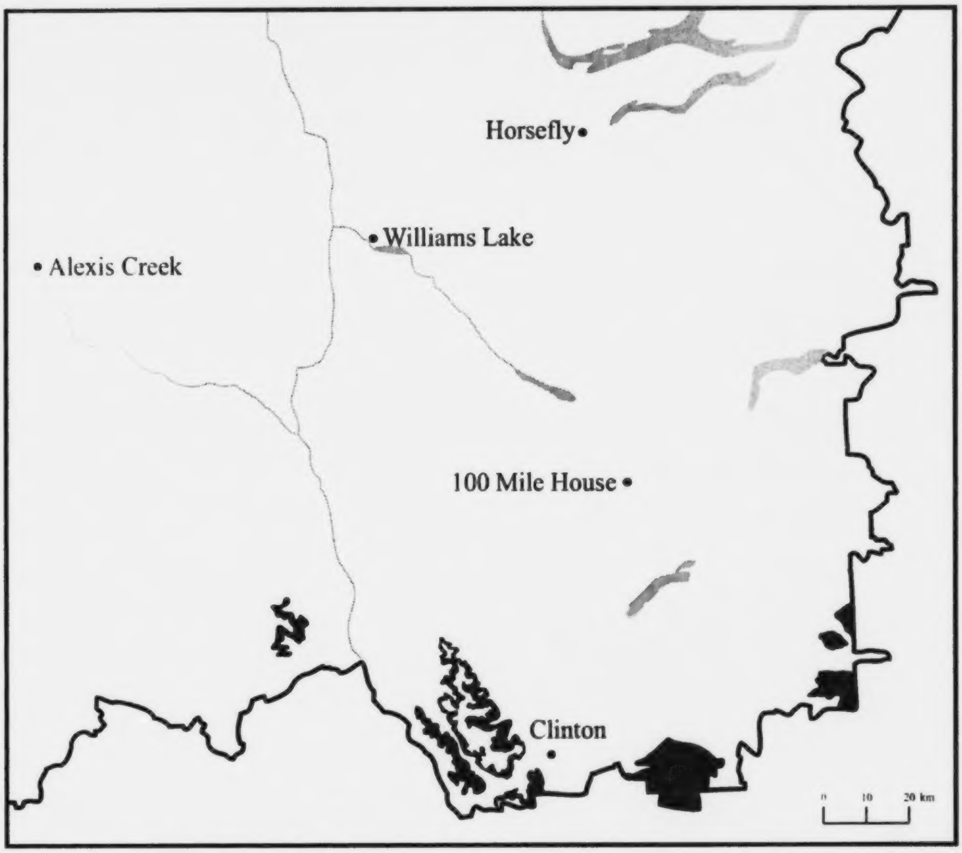
In the **SBPSmk**, zonal sites have:
- black huckleberry, dwarf blueberry, and knight's plume;
- little or no grouseberry.

In the **IDFdk3 and IDFdk4**, zonal sites have:
- Douglas-fir as climax tree species;
- kinnikinnick and dwarf blueberry;
- little or no grouseberry, hybrid white spruce, or arctic lupine.

In the **ESSFxc**, zonal sites have:
- white-flowered rhododendron and Sitka valerian;
- common subalpine fir;
- no pinegrass.

In the **ESSFxv**, zonal sites have:
- common subalpine fir;
- no pinegrass.

Distribution of MSxk Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0 10 20 km

Site Units of the MSxk

A site classification for the Kamloops Forest Region portion of the MSxk is described by Lloyd *et al.* (1990). Although this classification has not been thoroughly field tested in the Cariboo Forest Region, initial field tests indicate that it adequately describes at least the predominant MSxk site units in the Hihium Lake, Edge Hills, Camelsfoot Range, and Bonaparte Lake areas. Due to the calcareous soil parent materials and resulting differences in vegetation, it may apply less well to the Marble Range MSxk.

MSxv
MONTANE SPRUCE
VERY DRY VERY COLD SUBZONE

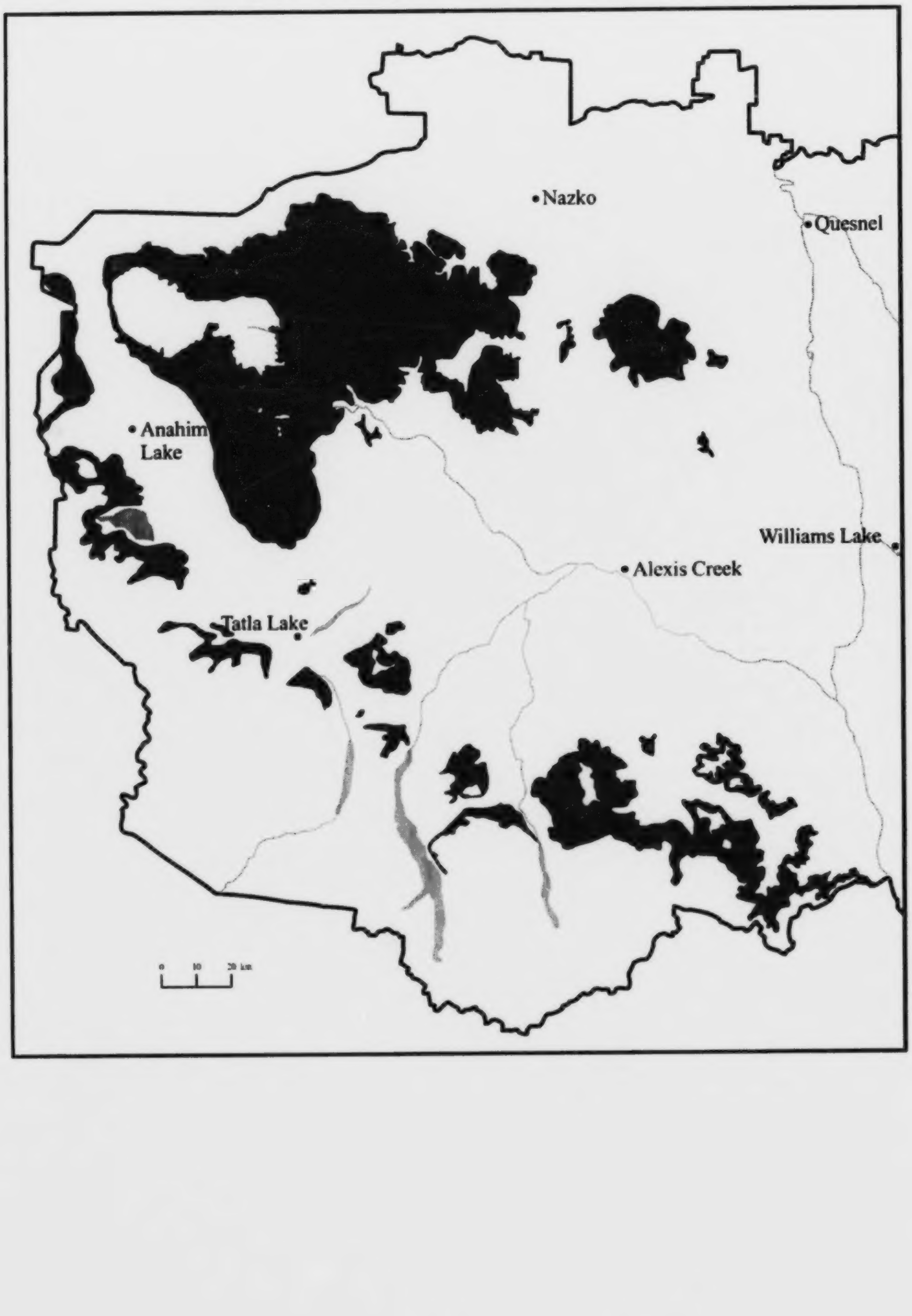
The MSxv is a moderately large (8731 km^2) subzone that occurs primarily within the Cariboo Forest Region. It is most extensive on the plateau landscapes that rise gently towards the Itcha Mountains from the south, east, and north. It also common on the leeward slopes of the Coast Mountains, overlooking the Fraser Plateau, at elevations above the SBPS and below the ESSFxv. It extends for only a short distance from the plateau into the valleys of the Coast Mountains and does not occur east of the Fraser River. Elevations are generally 1400–1700 m in the south and 1250–1500 m in the north.

Distinguishing Adjacent Units from the MSxv

The **SBSmc2** occurs at similar elevations northeast of Narcosli Lake and north of Wentworth Creek where precipitation is somewhat higher than in the MSxv. The **MSxk** occurs at similar elevations south of Churn Creek where the climate is warmer. At similar elevations within the valleys of the Coast Mountains, the MSxv is replaced by the **MSdc2** and **MSdv**. The MSdc2 occurs from the valley of Chilko Lake and westward, while the MSdv occurs at similar elevations in the Taseko Lakes valley. Low elevations of the MSxv most often border SBPS subzones. The **SBPSxc** occurs below the MSxv throughout most of its range south of the Itcha and Ilgachuz mountains. The **SBPSdc** and **SBPSmk** occur below the MSxv in the north-central part of the Cariboo Forest Region, while the **SBPSmc** occurs below the MSxv on the north side of the Itcha and Ilgachuz mountains and in the Dean River valley. The **IDFdk4** occurs below a small portion of the MSxv in the relatively warm areas where the Mosley and Homathko river valleys open onto the plateau. The **ESSFxv** occurs above the MSxv throughout its distribution.

In the **SBPSxc**, zonal sites have:
- no grouseberry or crowberry;
- short-awned ricegrass, spike-like goldenrod, and more abundant pinegrass;
- greater cover of lichens than mosses.

Distribution of MSxv Subzone in the Cariboo Forest Region


Nazko
Quesnel
Anahim Lake
Williams Lake
Alexis Creek
Tatla Lake
0 10 20 km

In the **SBPSdc**, zonal sites have:
- no grouseberry or crowberry;
- kinnikinnick and birch-leaved spirea;
- more abundant pinegrass and dwarf blueberry.

In the **SBPSmk**, zonal sites have:
- no grouseberry or crowberry;
- birch-leaved spirea, black huckleberry, trailing raspberry, and showy aster;
- more abundant pinegrass.

In the **SBPSmc**, zonal sites have:
- no grouseberry or crowberry;
- kinnikinnick, birch-leaved spirea.

cold, moist soils have:
- black spruce.

In the **IDFdk4**, zonal sites have:
- Douglas-fir–dominated forests;
- timber milk-vetch and abundant pinegrass;
- no bunchberry, grouseberry, crowberry, or knight's plume.

In the **MSxk**, zonal sites have:
- birch-leaved spirea, falsebox, and black huckleberry;
- more abundant pinegrass;
- no crowberry or common juniper.

In the **SBSmc2**, zonal sites have:
- subalpine fir common in overstory;
- black huckleberry, five-leaved bramble, and rosy twistedstalk;
- no grouseberry or crowberry.

In the **MSdc2**, zonal sites have:
- subalpine fir common in overstory;
- Douglas-fir, saskatoon, and more abundant pinegrass;
- no common juniper, crowberry, or grouseberry.

drier sites have:
- frequent falsebox.

In the **MSdv**, zonal sites have:
- strawberry, northern bedstraw, showy aster, and arctic lupine;
- abundant pinegrass and more common subalpine fir;
- little or no grouseberry or crowberry.

In the **ESSFxv**, zonal sites have:
- common arctic lupine and subalpine fir;
- no pinegrass.

mesic north aspects have:
- common white-flowered rhododendron.

wetter sites have:
- common Sitka valerian and Indian hellebore.

Site Units of the MSxv

Zonal Site Series **01 Pl - Grouseberry - Feathermoss Site Series** is the predominant site unit of the MSxv landscape on gentle to moderately steep, upper to lower slope positions on all aspects. The climax forest canopy is dominated by hybrid white spruce. Subalpine fir is occasionally present but is common in the canopy only in the area eastward from Vedan and Anvil mountains. Due to frequent wildfires and slow rates of succession, natural stands are most often dominated by lodgepole pine less than 200 years old. Hybrid white spruce, lodgepole pine, and occasionally subalpine fir regeneration are present. The undergrowth vegetation is dominated by low-growing forbs, dwarf shrubs, mosses, and lichens. Crowberry and grouseberry are characteristic species. Other common species are bunchberry, twinflower, one-sided wintergreen, and heart-leaved arnica. A nearly continuous cover of red-stemmed feathermoss, knight's plume, and *Dicranum* mosses is present.

Drier Sites Sites drier than zonal are common, and associated primarily with isolated bedrock outcrops and coarse sandy soils, often along major streams. Compared to the /01 site series, they have more kinnikinnick and ground lichens, and less spruce.

02 Pl - Fescue - Stereocaulon Site Series occurs on level to gently sloping, rapidly drained sandy soils. The mature forest canopy is dominated by lodgepole pine and tree regeneration is sparse. The shrub layer is sparse and consists of scattered soopolallie and common juniper. The herbaceous layer is also typically sparse and is distinguished by the presence of Altai fescue. A high cover of ground lichens, particularly *Stereocaulon* species, dominates the undergrowth vegetation. Altai fescue and the abundance of *Stereocaulon* lichens distinguishes this from other MSxv site units.

03 Pl - Kinnikinnick - Cladonia Site Series occurs on ridge crests and hilltops where soils are <50 cm deep over bedrock. It also occurs on mid to upper slope positions of steep (>30%), south-facing slopes. The forest canopy is moderately open and almost entirely lodgepole pine. The undergrowth vegetation is relatively sparse and characterized by scattered shrubs (primarily common juniper and soopolallie) and a low to moderate cover of low-growing herbaceous layer plants (especially kinnikinnick, twinflower, short-awned ricegrass, and Rocky Mountain butterweed). Ground lichens and *Dicranum* mosses are abundant. Together with the absence of grouseberry, they distinguish these sites from the moister /04 sites.

04 Pl - Grouseberry - Kinnikinnick Site Series includes a wide range of sites drier than the /01 site series: upper and crest slope positions with deep soils, coarse-textured glaciofluvial soils, steep (>30%) north-facing slopes, and moderate (15–30%) gradient south-facing slopes. The forest canopy is dominated by lodgepole pine, often with scattered hybrid white spruce and, in southeastern parts of the subzone, subalpine fir. The undergrowth consists of scattered low shrubs, dwarf shrubs, low forbs, mosses, and lichens. Lichens are very common but less abundant than in the /03 site series. Common undergrowth species include crowberry, kinnikinnick, grouseberry, soopolallie, and red-stemmed feathermoss. The undergrowth is distinguished from the /01 site series by abundant kinnikinnick and lichens, and from other dry sites by abundant grouseberry, crowberry, and red-stemmed feathermoss.

05 Pl - Trapper's tea - Crowberry Site Series has a localized known distribution, confined primarily to the vicinity of Vedan, Wales, and Piltz mountains in the South Chilcotin. It occurs predominantly on well- to moderately well-drained loamy soils on gentle to moderate north- and east-facing slopes. The mature forest canopy is dominated by lodgepole pine but occasionally includes hybrid white spruce and subalpine fir, which are the principal species of tree regeneration. The undergrowth is dominated by low shrubs, dwarf shrubs, and mosses, and is distinguished by abundant trapper's tea. Other principal species include grouseberry, crowberry, and red-stemmed feathermoss.

Wetter Sites Sites wetter than those of the /01 site series are relatively common on lower and toe slope positions and in valley bottoms. They also occur on sideslope seepage areas. The canopy is typically dominated by hybrid white spruce. Black twinberry, common mitrewort, and palmate coltsfoot are common in the undergrowth, and distinguish these sites from mesic and drier sites.

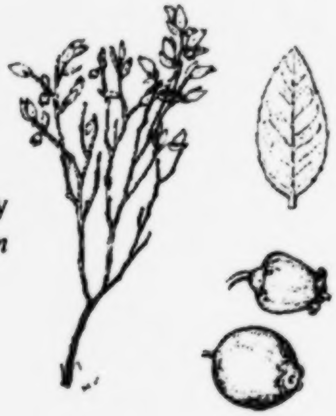
06 Sxw - Crowberry - Knight's plume Site Series occurs on mid, lower, and toe slope sites moistened by intermittent seepage. It is common along drainage tracks and and other sites only slightly wetter than the /01 unit. The mature forest canopy is dominated by hybrid white spruce and lodgepole pine with scattered subalpine fir in the southern part of the subzone. The undergrowth consists primarily of low shrubs, dwarf shrubs, low forbs, and mosses. Principal species include crowberry, grouseberry, black twinberry, twinflower, heart-leaved arnica, red-stemmed feathermoss, and step moss.

07 Sxw - Crowberry - Glow moss Site Series occurs on lower, toe, and depression slope positions, usually at the perimeter of wetlands. Seepage is more persistent and soils are more moist than in the /06 unit. The forest canopy is dominated by hybrid white spruce and lodgepole pine. Cover of low shrubs is low to moderate and includes scrub birch, willows, and black twinberry in most stands. Several low forbs and a well-developed moss layer are present. This site series is distinguished by relatively abundant scrub birch and a low cover of horsetail species and arrow-leaved groundsel. Glow moss is frequently abundant.

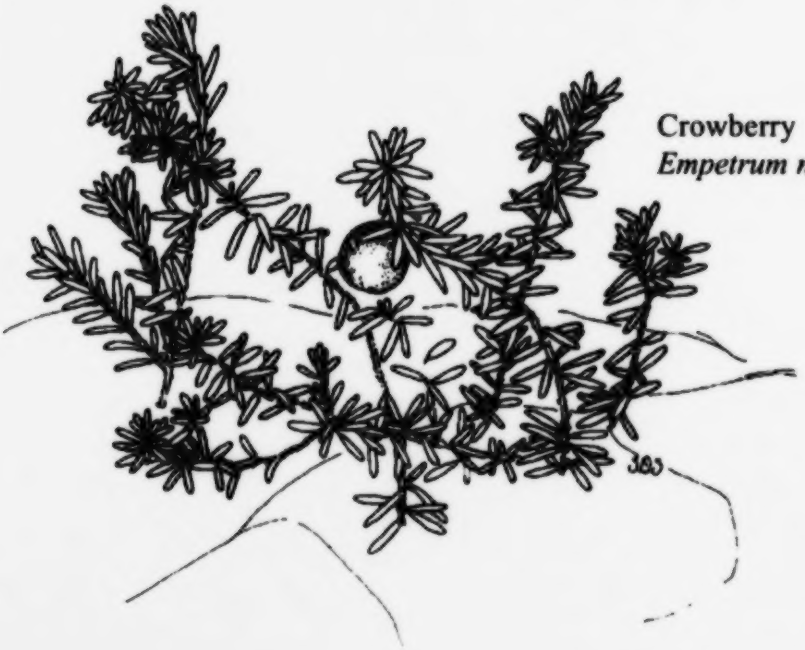
08 Sxw - Horsetail - Crowberry Site Series occurs at the toe of slopes and in depressions with a near-surface (<50 cm) water table. Most stands are small. Some are adjacent to non-forested wetlands but many are small forested wet sites within an upland forest matrix. The mature forest canopy is relatively open and dominated by hybrid white spruce. Lodgepole pine is seldom present. The undergrowth has abundant common horsetail, trailing raspberry, soft-leaved sedge, and glow moss. The abundance of common horsetail distinguishes the /08 from other sites wetter than mesic.

09 Sxw - Labrador tea - Willow Site Series has to date been recorded only south of Charlotte Lake. It occurs at the toe of slopes and in depressions with a near-surface (<50 cm) water table. These sites generally experience frequent growing season frosts. Soil surface organic layers are thick, and composed of peaty materials. The mature forest canopy is usually open and dominated by hybrid white spruce with a small number of lodgepole pine and subalpine fir. The undergrowth is distinguished by several "bog" species including Labrador tea, bog-laurel, scrub birch, and sphagnum moss.

Non-forested Sites Wetlands are abundant in the MSxv and are primarily fens, shrub-carrs, swamps, and shallow open water. Bogs are not common. The wetlands often form large integrated complexes of many wetland types. Moist meadows occur at the perimeter of many wetlands. Grasslands are uncommon in MSxv and occur primarily north and east of the Itcha Mountains. They include shrub- and grass-dominated "balds" on steep south aspects, and Altai fescue–lichen communities on level terrain. The presence of meadows and level grasslands may be due in large part to growing-season frosts, which discourage forest establishment.



Grouseberry
Vaccinium scoparium



Crowberry
Empetrum nigrum

Key to Site Units of the MSxv

1a. Moisture regime mesic or drier, no evidence of seepage inputs or water table within 1 m of soil surface; cover of ground lichens greater than 5%; black twinberry, palmate coltsfoot, glow moss, and step moss absent or incidental.

2a. Moisture regime xeric or subxeric; spruce and freckle pelt lichen absent or incidental; short-awned ricegrass, Rocky Mountain butterweed, or tall Jacob's ladder usually present.

3a. Soils shallow (<60 cm) to bedrock or if deeper then slope gradient >25 % **and** slope aspect SE, S, SW, or W; soil texture variable, parent material mostly morainal; cover of *Stereocaulon* lichens <5%; tall Jacob's ladder and northern goldenrod usually absent or incidental.

MSxv/03 Pl - Kinnikinnick - Cladonia
/03a Typic Phase (steep southerly slopes)
/03b Shallow Phase (shallow to bedrock)

3b. Soils deeper and slope grade <25%; slope aspect variable; soil texture sand or loamy sand, parent materials mostly glaciofluvial; cover of *Stereocaulon* lichens >5%; tall Jacob's ladder and northern goldenrod usually present.

MSxv/02 Pl - Fescue - Stereocaulon

2b. Moisture regime submesic or mesic; spruce and freckle pelt lichen usually present; short-awned ricegrass, Rocky Mountain butterweed, and tall Jacob's ladder absent or incidental.

4a. Trapper's tea cover >10%; slope aspect NW, N, NE, or E; recorded to date only from Big Creek drainage area.

MSxv/05 Pl - Trapper's tea - Crowberry

4b. Trapper's tea absent or incidental (<10 % cover); slope aspect variable.

5a. Moisture regime submesic; total ground lichen cover greater than total moss cover; cladonia lichen cover usually >5%, red-stemmed feathermoss cover <15%.

MSxv/04 Pl - Grouseberry - Kinnikinnick

5b. Moisture regime mesic; total lichen cover less than total moss cover, cladonia lichen cover usually <5 % and red-stemmed feathermoss cover >15%.
MSxv/01 Pl - Grouseberry - Feathermoss

1b. Moisture regime subhygric or wetter (mesic to subhygric in /06); evidence of significant seepage input or water table within 1 m of surface; total cover of ground lichens <5 %; black twinberry, palmate coltsfoot, glow moss, or step moss present.

6a. Moisture regime hygric or subhydric; common horsetail, leafy mosses, Labrador tea, or sphagnum (peat) mosses abundant (cover >10%).

7a. Common horsetail or leafy mosses abundant (>10% cover), Labrador tea and sphagnum mosses absent or incidental.
MSxv/08 Sxw - Horsetail - Crowberry

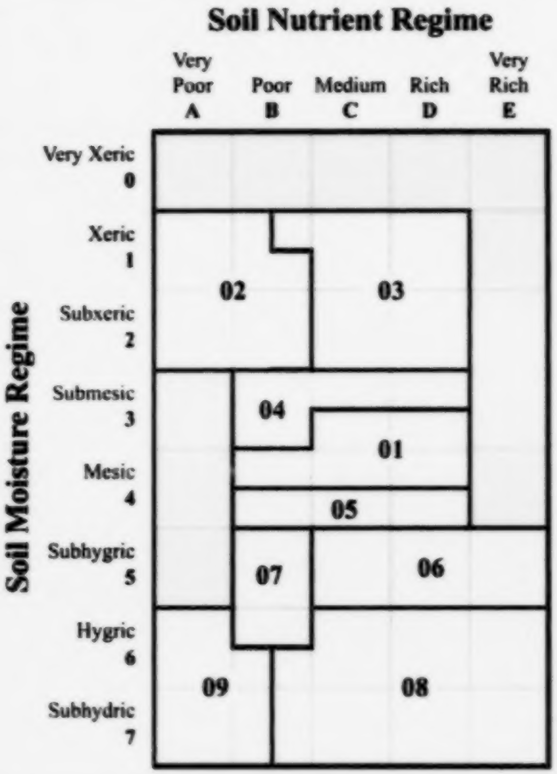
7b. Common horsetail and leafy mosses not abundant, Labrador tea and sphagnum moss abundant (>10 % cover).
MSxv/09 Sxw - Labrador tea - Willow

6b. Moisture regime predominantly subhygric or mesic; cover of common horsetail and leafy mosses <10% (often absent) and Labrador tea and sphagnum mosses absent or incidental.

8a. Moisture regime mesic to subhygric; horsetail species, scrub birch, arrow-leaved groundsel, and glow moss absent or incidental; soopolallie usually present.
MSxv/06 Sxw - Crowberry - Knight's plume

8b. Moisture regime subhygric; horsetail species, scrub birch, arrow-leaved groundsel, and glow moss usually present; soopolallie usually absent or incidental.
MSxv/07 Sxw - Crowberry - Glow moss

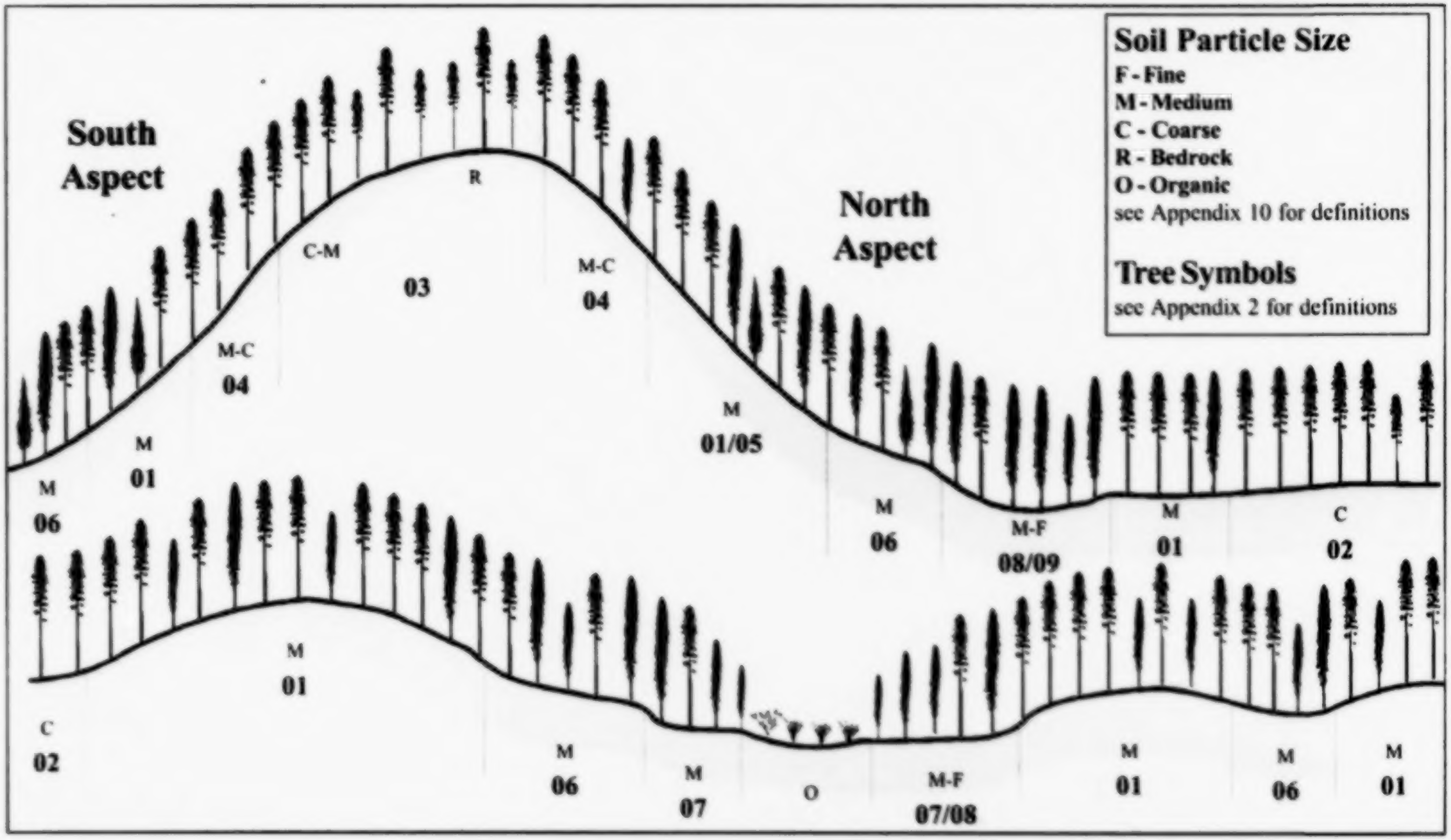
MSxv Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
01
05
07
06
09
08

Site Series

01	Pl - Grouseberry - Feathermoss
02	Pl - Fescue - Stereocaulon
03	Pl - Kinnikinnick - Cladonia
04	Pl - Grouseberry - Kinnikinnick
05	Pl - Trapper's tea - Crowberry
06	Sxw - Crowberry - Knight's plume
07	Sxw - Crowberry - Glow moss
08	Sxw - Horsetail - Crowberry
09	Sxw - Labrador tea - Willow

MSxv Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M 06
M 01
M-C 04
C-M
03
R
M-C 04
M 01/05
M 06
M-F 08/09
M 01
C 02
C 02
M 01
M 06
M 07
O
M-F 07/08
M 01
M 06
M 01

Site Features of MSxv Site Series

Site Series	01	02	03	04
Key Features	zonal and other gentle to moderately sloping sites with mesic or near-mesic moisture regime	gently sloping and level sites with sandy, gravelly soils on fluvial materials	hill crests and upper slopes on moderate to steep (> 25%) SE, S, SW, or W aspects (Typic Phase) and shallow soils (Shallow Phase) on crests.	wide range of sites drier than mesic: upper slopes, moderate (15 - 30%) south aspects, moderate and steep north aspects, and gentle slopes with sandy soils
Soil Moisture/ Nutrient Regimes	mesic (submesic)/ poor - rich	xeric, subxeric / very poor, poor	xeric, subxeric / poor - rich	submesic (mesic) / poor - rich
Slope Position	mid, level (upper, lower)	level (mid - upper)	crest, upper (mid, level)	upper, mid (crest - lower)
Aspect	all	all	all but primarily SE, S, SW, W	all
Slope Grade (%)	< 30	< 10	10 - 30 (0)	5 - 30 (0)
Soil Texture	(gravelly) loamy	(gravelly) sandy	gravelly sandy, (loamy)	sandy, loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor, Mormoder 3 - 5	Xeromor, Velomor 1-4	Xeromor, Velomor 2-5	Hemimor (variable) 2 - 5
Occurrence / Size / Distribution	predominant / medium, large / wide	uncommon / small, medium / mostly east of Itcha Mountains	common / small / wide	common / medium, large / wide

Site Features of MSxv Site Series (continued)

Site Series	05	06	07	08	09
Key Features	mesic sites on gentle to moderately sloping N and E aspects with loamy soils	mid, lower, and toe slope sites slightly more moist than /01 due to intermittent seepage	moist sites on lower, toe, and depression slope positions with persistent seepage but no water table within 50 cm of surface; usually at perimeter of wetland	wet sites on toe slope positions and in depressions with near-surface (< 50 cm) water table	similar to /08 but to date noted only south of Charlotte Lake on soils derived from acidic rocks
Soil Moisture / Nutrient Regimes	mesic / poor - rich	subhygric (mesic) / medium - very rich	subhygric (hygric) / poor (medium)	hygric, subhydric / poor - very rich	hygric, subhydric/ very poor, poor
Slope Position	mid	mid, lower, toe	lower, toe, depression	toe, depression (level)	toe, depression
Aspect	NW, N, NE, E	all	all	N/A	NW, N, NE, E
Slope Grade(%)	< 30	< 20	0 - 10 (20)	< 5	< 10
Soil Texture	loamy	variable but predominantly loamy	mostly fine loamy	loamy, silty and clayey	silty (loamy)
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 3 - 6	Hemimor, Mormoder 3 - 6	Hemihumimor, Hydromor 3 - 10 (20)	Hydromoder 5 - 30	Saprimull, Hydromor 10 - 30
Occurrence / Size / Distribution	uncommon / medium, small / Big Creek watershed	common / small - medium / wide	uncommon / small / wide	uncommon / small / wide	very uncommon / small / south of Charlotte Lake

MSxv Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	09	
Tree	*Pinus contorta*	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮		▮▮▮▮▮	lodgepole pine
Layer	*Picea engelmannii* x *glauca*				▮	▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	hybrid white spruce
Shrub	*Shepherdia canadensis*		▮▮▮	▮▮▮	▮	▮▮▮	▮▮▮				soopolallie
Layer	*Juniperus communis*	▮▮	▮▮▮▮	▮▮▮	▮▮▮		▮			▮	common juniper
	Rosa acicularis		▮▮	▮	▮		▮▮	▮	▮▮		prickly rose
	Abies lasiocarpa			▮		▮	▮	▮		▮▮▮▮	subalpine fir
	Ledum glandulosum					▮▮▮▮▮					trapper's tea
	Salix spp.					▮	▮	▮▮▮		▮▮▮	willows
	Betula glandulosa							▮▮▮		▮▮▮	scrub birch
	Lonicera involucrata						▮▮▮	▮▮	▮▮	▮▮▮	black twinberry
	Ledum groenlandicum								▮▮	▮▮▮▮▮	Labrador tea
Herb	*Oryzopsis pungens*	▮▮	▮								short-awned ricegrass
Layer	*Polemonium caeruleum*	▮▮									tall Jacob's ladder
	Festuca altaica	▮▮▮									altai fescue
	Solidago multiradiata	▮▮									northern goldenrod
	Arctostaphylos uva-ursi	▮▮▮	▮▮▮▮	▮▮▮							kinnikinnick
	Achillea millefolium				▮	▮	▮▮	▮▮		▮	yarrow
	Epilobium angustifolium	▮▮	▮▮	▮▮	▮▮	▮	▮▮	▮▮	▮▮	▮▮	fireweed
	Linnaea borealis		▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮	twinflower
	Arnica cordifolia		▮	▮▮	▮▮▮	▮▮	▮▮▮	▮▮▮		▮	heart-leaved arnica
	Cornus canadensis		▮	▮	▮▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	bunchberry
	Vaccinium scoparium			▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	grouseberry
	Empetrum nigrum			▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮	▮▮▮▮▮	crowberry
	Mitella nuda						▮		▮▮		common mitrewort
	Petasites palmatus						▮▮▮	▮▮▮	▮▮▮	▮	palmate coltsfoot
	Sanguisorba canadensis									▮▮▮	Sitka burnet
	Platanthera dilatata									▮▮	white bog-orchid
	Equisetum arvense							▮▮	▮▮▮▮▮	▮	common horsetail
	Carex disperma								▮▮▮		soft leaved sedge
Moss	*Stereocaulon* spp.	▮▮▮▮▮	▮▮	▮		▮					coral lichens
Layer	*Cladina* spp.	▮▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮		▮			reindeer lichens
	Cladonia spp.	▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮				▮	cladonia lichens
	Dicranum spp.	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮	▮		▮	heron's-bill mosses
	Peltigera spp.	▮▮▮	▮▮▮▮	▮	▮					▮	pelt lichens
	Peltigera aphthosa			▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮			freckle pelt
	Pleurozium schreberi		▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮	red-stemmed feathermoss
	Hylocomium splendens						▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮		step moss
	Aulacomnium palustre					▮	▮	▮▮▮▮	▮▮▮	▮	glow moss
	Sphagnum spp.									▮▮▮▮	sphagnums
	Mnium spp.								▮▮▮▮		leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBPSdc
SUB-BOREAL PINE–SPRUCE
DRY COLD SUBZONE

The SBPSdc occurs west of the Fraser River in the north-central portion of the Cariboo Forest Region where the Coast Mountains rainshadow is less pronounced than southward in the SBPSxc. It occurs about as far south as Palmer Lake and as far west as Kluskus Lakes. The boundaries between the SBPSdc and the SBPSmc near Kluskus Lakes and between the SBPSdc and the SBPSxc near Palmer Lake are broad transitions that are not sharply defined. Elevations of the SBPSdc are generally 1000–1280 m in the south, and 900–1225 m in the north.

Distinguishing Adjacent Units from the SBPSdc

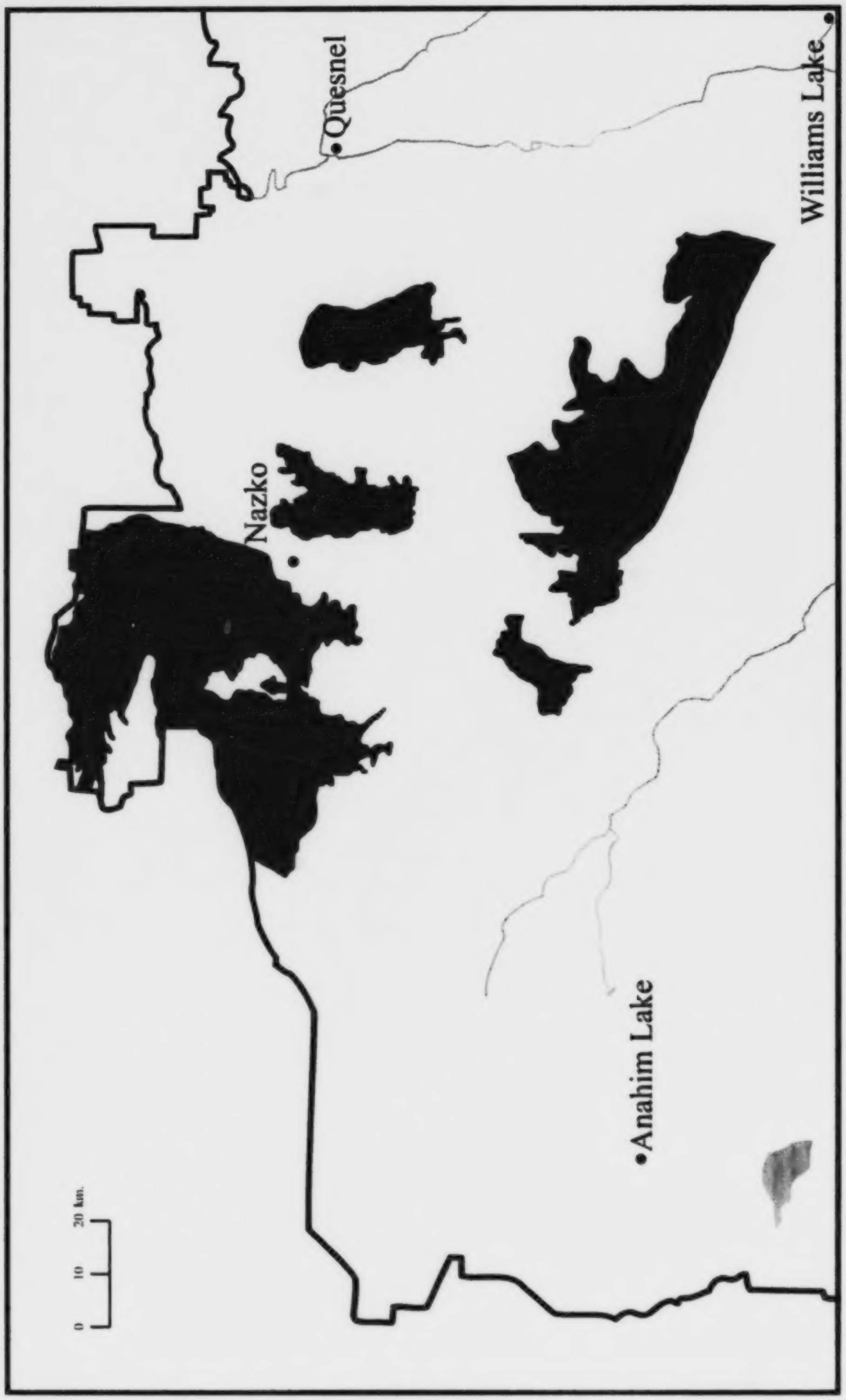
The **SBPSxc** replaces the SBPSdc at similar elevations in the drier climate south of approximately Palmer Lake, while the **SBPSmc** occurs at similar elevations in the slightly wetter climate north of the Itcha Mountains, near Kluskus Lakes. At its upper elevations, the SBPSdc borders either the **MSxv** in dry areas (west of the Itcha and Ilgachuz mountains) or the **SBSmc2** in wetter areas. The **SBSdw2** occurs below the SBPSdc in the Blackwater and Nazko river valleys, and the **IDFdk3** occurs at lower elevations on slopes leading into the Fraser River valley. In portions of the Snaking River and Baker Creek drainages, the SBPSdc occurs in broad basins where cold air apparently accumulates. In these areas, the **SBPSmk** occurs at elevations above the SBPSdc where air drainage is improved.

In the **SBPSxc**, zonal sites have:
- moss/lichen layer dominated by lichens rather than feathermosses;
- spruce infrequent in tree and regeneration layers;
- kinnikinnick cover generally >15%;
- less vigorous pinegrass and little or no dwarf blueberry.

In the **SBPSmc**, zonal sites have:
- little or no pinegrass.

In the **MSxv**, zonal sites have:
- black crowberry or grouseberry;
- little or no pinegrass;
- occasional subalpine fir.

Distribution of SBPSdc Subzone in the Cariboo Forest Region


Quesnel
Williams Lake
Nazko
Anahim Lake
0
10
20 km.

In the **SBSmc2**, zonal sites have:
- five-leaved bramble, rosy twistedstalk, and bluejoint;
- black huckleberry;
- common subalpine fir;
- little or no common juniper, short-awned ricegrass, spike-like goldenrod, or kinnikinnick;
- less abundant pinegrass (not dominant);
- very few or no cladonia or cladina lichens.

In the **SBSdw2**, zonal sites have:
- Douglas-fir often dominant in canopy;
- thimbleberry, falsebox, highbush-cranberry, and subalpine fir;
- little or no short-awned ricegrass, spike-like goldenrod, or kinnikinnick.

In the **IDFdk3**, zonal sites have:
- Douglas-fir–dominated climax forest canopy;
- more abundant and vigorous pinegrass;
- common timber milk-vetch;
- no bunchberry or short-awned ricegrass.

In the **SBPSmk**, zonal sites have:
- common black huckleberry;
- rattlesnake-plantain and tiger lily;
- little or no short-awned ricegrass or spike-like goldenrod;
- occasional Douglas-fir.

Site Units of the SBPSdc

Zonal Site Series **01 Pl - Juniper - Feathermoss Site Series** is by far the predominant site series of the SBPSdc landscape. The vegetation is mostly even-aged lodgepole pine stands, which occur in a patchwork of age classes, stem densities, and stand sizes, depending on fire history. Small aspen stands are locally present. Although hybrid white spruce is in the understory of most stands, the dominance of pine has been maintained by frequent fires and relatively slow rates of succession. The undergrowth is dominated by pinegrass, red stemmed feathermoss, dwarf shrubs (especially kinnikinnick), and low herbs such as twinflower. A few low shrubs, especially soopolallie, are also present in most stands.

Drier Sites Sites drier than mesic are moderately common but generally small. They occur on crest and upper slope positions with shallow soils, on coarse glaciofluvial soils, and on localized steep slopes. The forest canopy is dominated by lodgepole pine, but is typically more open than on mesic sites, and spruce is less common in the understory. Pinegrass is less abundant, and kinnikinnick is more abundant, than on mesic sites.

02 Pl - Kinnikinnick - Cladonia Site Series occurs on a) steep (>25%) south- or west-facing slopes and b) upper and crest slope positions with shallow (<50 cm) soils over bedrock. These two classes of sites have similar climax vegetation. The forest canopy is dominated by lodgepole pine, occasionally with scattered spruce. The undergrowth is dominated by low shrubs, especially common juniper and soopolallie, and kinnikinnick. Ground lichens are abundant but moss cover is usually sparse.

03 Pl - Kinnikinnick - Feathermoss Site Series occurs on a range of sites including upper and crest slope positions with deep soils, gentle mid to upper slope and level sites with sandy glaciofluvial soils, and some gentle to moderate (<25%) gradient south aspects. The mature forest canopy is dominated by lodgepole pine, occasionally with scattered hybrid white spruce. The undergrowth is distinguished from the /02 site series by having more pinegrass, twinflower, and dwarf blueberry. Predominant undergrowth species are kinnikinnick, lichens, and a sparse to moderate cover of red-stemmed feathermoss.

Wetter Sites Sites wetter than mesic are more common and extensive than in the SBPSxc but are generally small and localized. They include narrow bands on lower slopes at the perimeter of wetlands, imperfectly drained valley bottom flats, streamside riparian ecosystems, and localized wet depressions. Sideslope seepage areas are uncommon. The mature canopy is usually dominated by hybrid white spruce. The undergrowth is distinguished by the presence of black twinberry, common mitrewort, and palmate coltsfoot.

04 PlSb - Feathermoss Site Series includes pine- and black spruce–dominated forests on moderately well to imperfectly drained valley-bottom lower slopes and flats where cold air accumulates and soils are relatively cold. It is most common in the Baker Creek and Snaking River basins. The canopy is dominated by lodgepole pine, black spruce, and hybrid white spruce. Black spruce often forms a lower canopy layer and a large proportion of the tree regeneration. The undergrowth is dominated by feathermosses and a sparse to moderate cover of low herbaceous species. These sites are distinguished from drier sites by palmate coltsfoot and black spruce and more abundant pinegrass, and from wetter sites by the absence of horsetails, leafy mosses, and golden fuzzy fen moss and by their smaller cover of black twinberry.

05 Sxw - Scrub birch - Feathermoss Site Series occurs on moist lower and toe slope sites with intermittent to persistent seepage. It is commonly present at the perimeter of herbaceous wetlands where cold air accumulates. The mature forest canopy is dominated by hybrid white spruce but often includes scattered lodgepole pine. The undergrowth vegetation has a low to moderate cover of shrubs, especially black twinberry, willows, and scrub birch. Several low herbs, predominantly palmate coltsfoot and twinflower, are present but total cover is very open. A sparse cover of pinegrass is sometimes present. Feathermosses, especially step moss and red-stemmed feathermoss, are abundant. The vegetation is distinguished by abundant palmate coltsfoot but little or no black spruce, trailing raspberry, horsetail species, or soft-leaved sedge.

06 Sxw - Horsetail - Meadowrue Site Series occurs primarily as a narrow riparian zone along permanent stream channels. Persistent seepage provides moisture and nutrients, resulting in relatively high forest productivity. The mature forest canopy is dominated by relatively large-diameter hybrid white spruce and occasional lodgepole pine. The undergrowth is characterized by a black twinberry–dominated low shrub layer, a rich variety of low herbaceous species including trailing raspberry and palmate coltsfoot, and a moss layer that includes abundant leafy mosses.

07 Sb - Scrub birch - Sedge Site Series includes wet forested sites transitional between upland forests and bogs. A water table is usually within 50 cm of the surface, and soils are usually peaty. The forest canopy is open and dominated by black spruce. The undergrowth is dominated by mosses, including a large cover of sphagnum mosses. Other plants include common horsetail, scrub birch, and soft-leaved sedge.

08 Sxw - Horsetail - Glow moss Site Series also occurs on wet toe slope positions and depressions where a water table is usually within 50 cm of the surface. However, this unit does not have organic soils or abundant sphagnum moss. The open forest canopy is dominated by black spruce and white spruce, and the undergrowth is characterized by >5% cover of common horsetail and leafy mosses.

Non-forested Sites Wetlands are abundant in the SBPSdc and include fens, swamps, marshes, shrub-carrs, and bogs. Bogs are more common than in the SBPSxc but are a relatively minor component of the landscape. Wetland complexes, consisting of two or more linked wetlands with islands of upland vegetation, are common. Grasslands are uncommon but low shrub– and grass-dominated vegetation occurs locally on steep south- and west-facing slopes and on some gentle lower slopes of small valleys and ravines where cold air accumulates or where salts are precipitated within the soil rooting zone.

Key to Site Units of the SBPSdc

1a. Moisture regime mesic or drier, evidence of seepage water or water table not present within 1 m of soil surface; kinnikinnick, spike-like goldenrod, or birch-leaved spirea present; common mitrewort, palmate coltsfoot, and black twinberry absent.

2a. Soils shallow (<50 cm) to bedrock or slope gradient >25% **and** slope aspect SE, S, SW, or W (100–280°); red-stemmed feathermoss and wavy-leaved moss absent or sparse.

SBPSdc/02 Pl - Kinnikinnick - Cladonia
/02a Typic Phase (steep slopes)
/02b Shallow Phase

2b. Soils not shallow; slope not steep and south- or west-facing (may be steep and NW, N, NE, or E); red-stemmed feathermoss and wavy leaved moss usually present.

3a. Moisture regime subxeric or submesic; kinnikinnick cover >20% or short-awned ricegrass and *Cetraria* lichens present; pinegrass cover usually <10%.

SBPSdc/03 Pl - Kinnikinnick - Feathermoss
/03a Typic Phase (soil texture not sand)
/03b Sand Phase (sand or loamy sand)

3b. Moisture regime mesic; kinnikinnick cover usually <20% and short-awned ricegrass and *Cetraria* lichens absent or incidental; pinegrass cover usually >10%.
SBPSdc/01 Pl - Juniper - Feathermoss

1b. Moisture regime subhygric or wetter (occasionally mesic in /04), evidence of seepage water or water table usually present within 1 m of surface; kinnikinnick, spike-like goldenrod, and birch-leaved spirea usually absent or incidental; common mitrewort, palmate coltsfoot, or black twinberry present.

4a. Moisture regime subhygric (occasionally mesic in /04), no persistent seepage or water table present within 50 cm of soil surface; common horsetail, soft-leaved sedge, and sphagnum moss absent or incidental.

5a. Black spruce and pinegrass present.
SBPSdc/04 PlSb - Feathermoss

5b. Black spruce and pinegrass absent or incidental.

6a. Black twinberry cover >5%, highbush-cranberry present; parent material usually fluvial, and sites usually streamside riparian.
SBPSdc/06 Sxw - Horsetail - Meadowrue

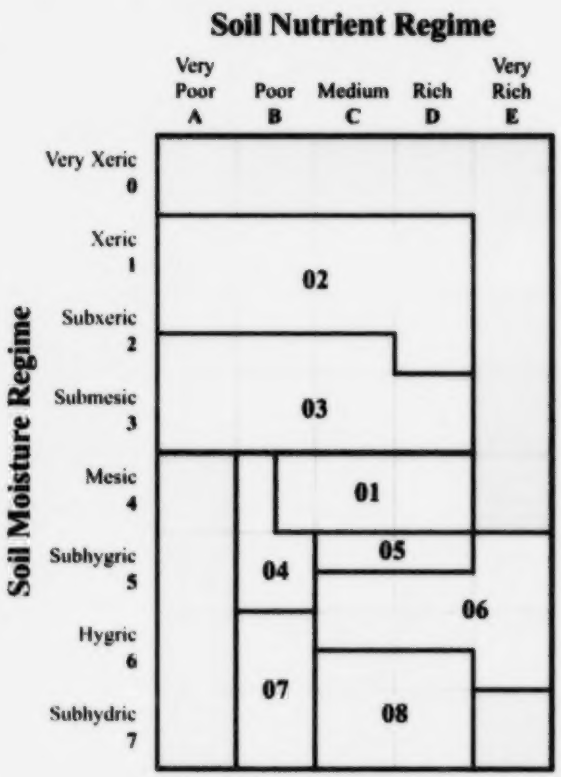
6b. Black twinberry cover ≤5%, highbush-cranberry absent; parent materials and site variable.
SBPSdc/05 Sxw - Scrub birch - Feathermoss

4b. Moisture regime hygric or subhydric, water table usually present within 50 cm of soil surface; common horsetail, soft-leaved sedge, or sphagnum moss cover >5%.

7a. Sphagnum moss cover >5%; black spruce present; common horsetail usually not abundant.
SBPSdc/07 Sb - Scrub birch - Sedge

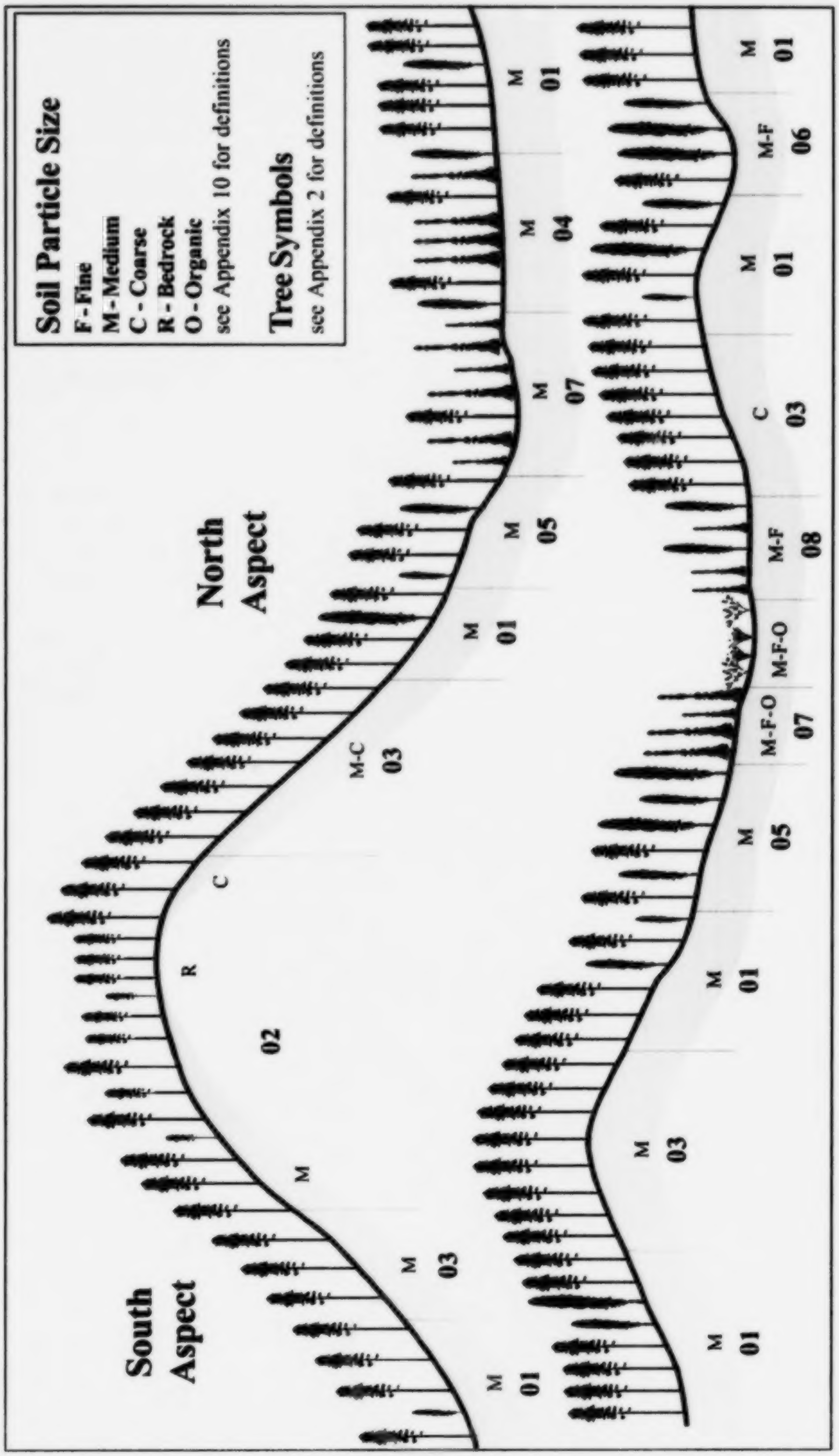
7b. Sphagnum moss cover <5%; black spruce usually absent; common horsetail cover >5%.
SBPSdc/08 Sxw - Horsetail - Glow moss

SBPSdc Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
01
05
04
06
07
08

Site	Series
01	Pl - Juniper - Feathermoss
02	Pl - Kinnikinnick - Cladonia
03	Pl - Kinnikinnick - Feathermoss
04	PlSb - Feathermoss
05	Sxw - Scrub birch - Feathermoss
06	Sxw - Horsetail - Meadowrue
07	Sb - Scrub birch - Sedge
08	Sxw - Horsetail - Glow moss

SBPSdc Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M 01
M 03
M
02
R
C
M-C 03
M 01
M 05
M 07
M 04
M 01
M 01
M 03
M 01
M 05
M-F-O 07
M-F-O
M-F 08
C 03
M 01
M-F 06
M 01

Site Features of SBPSdc Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	shallow (< 50 cm) soils over bedrock (Shallow Phase) and mid to upper slope position on steep S- or W-facing slopes (Typic Phase)	wide range of sites drier than mesic: a) upper slopes (not steep S or W), moderate (15 - 25%) south aspects, steep N aspects and b) gentle slopes with sandy soils	mesic and moist lower and toe slope sites with cold air ponding and cold soils; primarily in large cold air basins on level to gently sloping sites
Soil Moisture / Nutrient Regimes	mesic / poor - rich	xeric, subxeric / very poor - rich	subxeric, submesic / very poor - rich	mesic, subhygric / poor
Slope Position	level, mid (upper to lower)	crest, upper, mid	mid to crest and (if soils sandy) level	mid, lower, toe
Aspect	all	SE, S, SW, or W but all if soils shallow	all	all
Slope Grade (%)	0 - 20	0 - 20 on crests; 20 - 60 on mid to upper slope	0 - 25, except 0 - 60 on E and N aspects	0 - 20
Soil Texture	loamy	loamy or sandy	loamy, sandy	loamy, silty
Soil Humus Form and Thickness (cm)	Hemimor, Xeromor 2 - 5	Xeromor 0 - 3, discontinuous	Xeromor, Hemimor 2 - 5	Hemimor 3 - 5
Occurrence / Size / Distribution	predominant / large / wide	common / small / wide	common / small / wide	uncommon / moderate / northern parts

Site Features of SBPSdc Site Series (continued)

Site Series	05	06	07	08
Key Features	moist lower and toe slope positions, often at perimeter of wetlands; no water table within 50 cm of surface	moist lower and toe slope sites adjacent to perennial stream channels; often on floodplains of larger streams	wet depressions and toe slope positions with near-surface water table and organic soils	wet depressions and toe slope positions with near-surface water table and mineral soils (may be thick forest floor)
Soil moisture / Nutrient Regimes	subhygric / medium, rich	subhygric, hygric / medium - very rich	hygric, subhydric / poor	hygric, subhydric / medium, rich
Slope position	lower, toe, level	lower, toe, depression	toe, depression	toe, depression
Aspect	all	all	all	all
Slope Grade (%)	0 - 5	0 - 10	0 - 5	0 - 5
Soil Texture	loamy, silty, sandy	loamy, silty	organic	silty, sandy
Soil Humus Form and Thicknes (cm)	Hemimor 2 - 5	Mormoder, Hemimor 3 - 7	peaty 'O' horizons (organic soils)	Hydromor > 25
Occurrence / Size / Distribution	common / small / wide	common / small / wide	uncommon / small / wide	common / small / wide

SBPSdc Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮				lodgepole pine
	Picea engelmannii x *glauca*			▮		▮▮▮▮▮	▮▮▮▮▮		▮▮▮▮▮	hybrid white spruce
	Picea mariana			▮▮▮▮▮				▮▮▮▮	▮	black spruce
Shrub Layer	*Juniperus communis*	▮▮▮▮	▮▮▮▮	▮	▮▮▮	▮▮				common juniper
	Shepherdia canadensis	▮▮▮	▮▮▮	▮▮	▮▮▮	▮				soopolallie
	Rosa acicularis	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮		▮▮	prickly rose
	Lonicera involucrata			▮▮		▮▮▮	▮▮▮▮		▮▮▮	black twinberry
	Betula glandulosa					▮▮		▮▮▮▮		scrub birch
	Viburnum edule						▮▮▮		▮▮	highbush-cranberry
Herb Layer	*Oryzopsis pungens*	▮▮	▮▮							short-awned ricegrass
	Solidago spathulata	▮▮	▮▮		▮					spike-like goldenrod
	Arctostaphylos uva-ursi	▮▮▮▮▮	▮▮▮▮▮		▮▮▮					kinnikinnick
	Calamagrostis rubescens	▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮				pinegrass
	Fragaria virginiana	▮▮	▮▮	▮▮	▮▮	▮▮	▮▮			wild strawberry
	Vaccinium caespitosum		▮▮▮	▮▮▮	▮▮▮	▮				dwarf blueberry
	Linnaea borealis	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮▮	twinflower
	Cornus canadensis		▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	bunchberry
	Galium boreale	▮▮	▮	▮▮	▮	▮▮	▮▮		▮	northern bedstraw
	Petasites palmatus			▮▮▮		▮▮▮	▮▮▮	▮▮▮	▮▮	palmate coltsfoot
	Aster ciliolatus			▮▮	▮	▮▮	▮			fringed aster
	Geocaulon lividum			▮	▮▮	▮				bastard toad-flax
	Mitella nuda			▮		▮▮	▮▮▮	▮▮	▮▮	common mitrewort
	Arnica cordifolia			▮▮	▮▮	▮▮			▮	heart-leaved arnica
	Rubus pubescens			▮		▮	▮▮▮		▮▮▮	trailing raspberry
	Actaea rubra						▮▮			baneberry
	Calamagrostis canadensis						▮▮	▮▮	▮	bluejoint
	Thalictrum occidentale						▮▮			western meadowrue
	Carex disperma						▮	▮▮▮	▮▮▮	soft-leaved sedge
	Equisetum arvense						▮▮▮	▮▮▮	▮▮▮▮▮	common horsetail
Moss Layer	*Cladonia* spp.	▮▮▮▮	▮▮▮		▮					cladonia lichens
	Cladina spp.	▮▮▮	▮▮▮▮▮	▮▮	▮▮▮	▮▮		▮▮		reindeer lichens
	Dicranum polysetum	▮	▮▮▮	▮▮▮	▮▮▮	▮				wavy-leaved moss
	Peltigera aphthosa	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮	▮▮	▮	freckle pelt
	Pleurozium schreberi		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	red-stemmed feathermoss
	Ptilium crista-castrensis			▮▮▮▮		▮▮▮▮	▮▮▮▮		▮	knight's plume
	Hylocomium splendens			▮▮▮▮▮		▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	step moss
	Mnium spp.						▮▮▮	▮▮▮	▮▮▮▮	leafy mosses
	Tomenthypnum nitens					▮	▮	▮▮▮▮▮	▮	golden fuzzy fen moss
	Sphagnum spp.							▮▮▮▮▮	▮	sphagnums

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBPSmc
SUB-BOREAL PINE–SPRUCE
MOIST COLD SUBZONE

The SBPSmc occurs north of the Itcha and Ilgachuz ranges in the northwestern corner of the Cariboo Forest Region (1165 km^2), and in the adjacent Prince Rupert Forest Region and Prince George Forest Region. In the Dean River valley of the Cariboo Forest Region, it occurs as far south as about Lessard Lake, while at the northern border of the Region, along the Blackwater River, it occurs about as far east as Kluskus Lakes. The transition between the SBPSmc and the SBPSdc at the eastern extent of the SBPSmc is broad. Elevations of the SBPSmc in the Cariboo Forest Region are generally 900–1250 m.

Distinguishing Adjacent Units from the SBPSmk
(Cariboo Forest Region only)

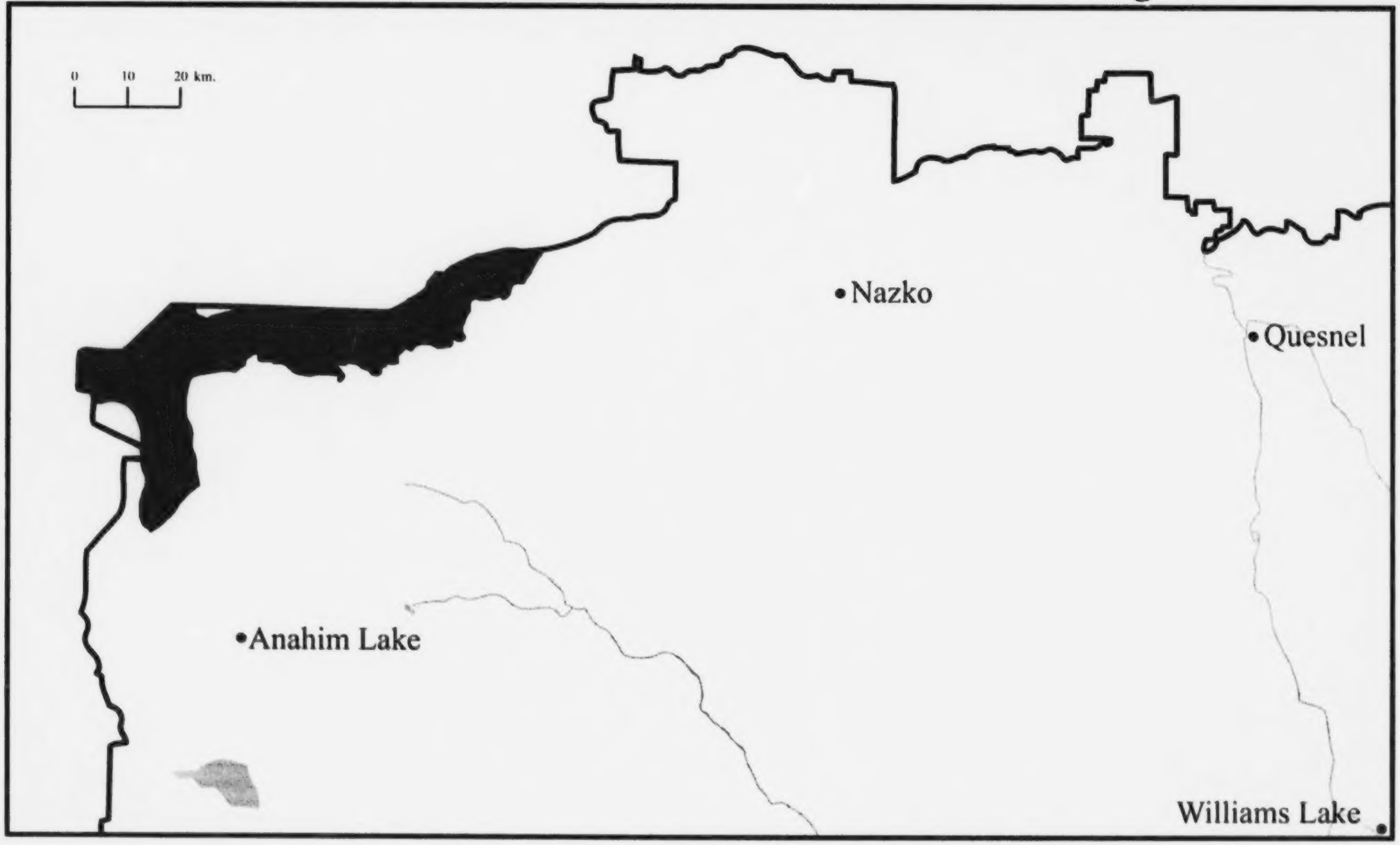
The **SBPSdc** occurs at similar elevations along the Blackwater River east of Kluskus Lakes. The transition between the SBPSdc and SBPSmc is broad. The **SBPSxc** occurs at similar elevations south of the SBPSmc in the Dean River valley. In the Cariboo Forest Region, the SBPSmc is most often replaced at higher elevations by the **MSxv**. North of Eliguk Lake, a small area of **SBSmc2** borders the upper elevations of the SBPSmc.

In the **SBPSdc** and **SBPSxc**, zonal sites have:
- abundant pinegrass;
- no bluejoint, knight's plume moss, or black huckleberry.

In the **MSxv**, zonal sites have:
- abundant crowberry and grouseberry.

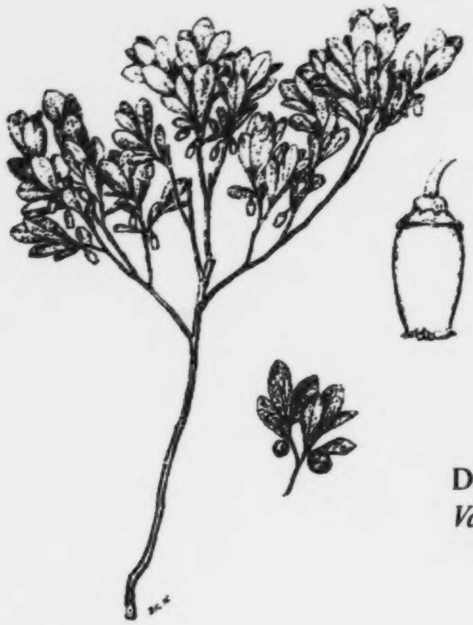
In the **SBSmc2**, zonal sites have:
- subalpine fir, rosy twistedstalk, and five-leaved bramble;
- little or no common juniper or kinnikinnick.

Distribution of SBPSmc Subzone in the Cariboo Forest Region

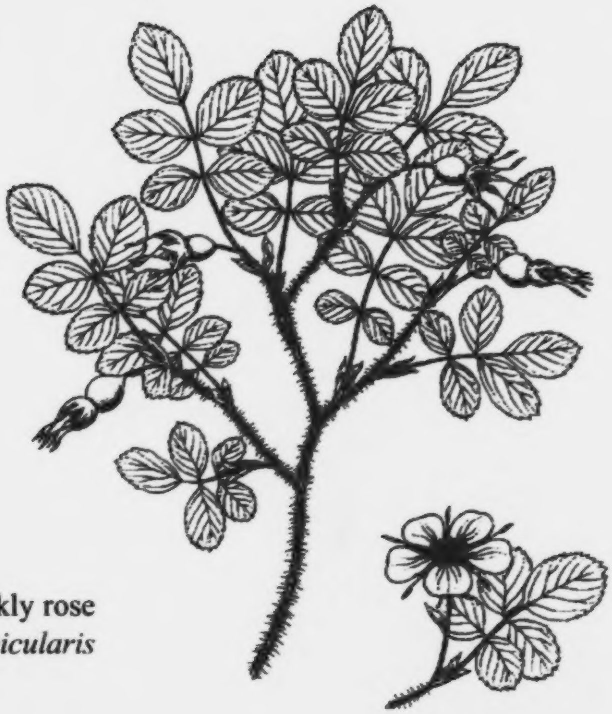

0
10
20 km.
Nazko
Quesnel
Anahim Lake
Williams Lake

Site Units of the SBPSmc

A site classification has been developed for the SBPSmc of the Prince Rupert Forest Region (Banner *et al.* 1993) and Prince George Forest Region (DeLong *et al.* 1993). A separate classification has not been developed for the Cariboo Forest Region but preliminary surveys indicate that site units described in these guides generally apply to the Cariboo Forest Region. The reader should consult these guides for a description of site units of the SBPSmc.



Dwarf blueberry
Vaccinium caespitosum



Prickly rose
Rosa acicularis

SBPSmk
SUB-BOREAL PINE–SPRUCE MOIST COOL SUBZONE

The SBPSmk occurs in two separate areas on the Fraser Plateau: 1) the southeastern portion of the Cariboo Forest Region in a northwest–southeast band from approximately McIntosh Lakes to Bonaparte Lake, and 2) the Blackwater–Nazko rivers area in the north-central portion of the Region. In the southeastern area, it occurs primarily on a low-relief plain, although the topography becomes hilly near Bonaparte Lake. In the north-central area, it occurs on gently rolling topography at middle elevations, above the SBSdw. Elevations are approximately 1000–1350 m in the southeastern area and 950–1250 m in the Blackwater–Nazko rivers area.

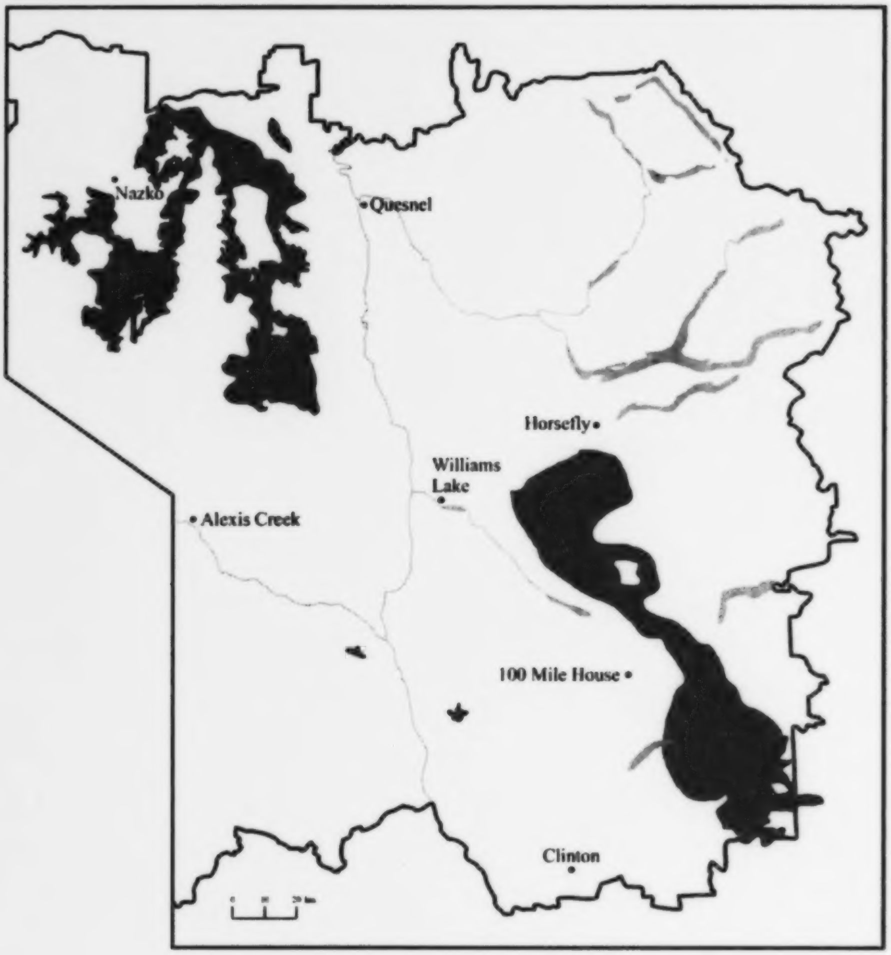
Distinguishing Adjacent Units from the SBPSmk

In the southeastern portion of the Cariboo Forest Region, the **IDFdk3** occurs at similar elevations west of the SBPSmk where precipitation is slightly less. The **SBSdw1** and **SBSdw2** occur at similar elevations north and east of the SBPSmk where topographic relief is greater, cold air drainage is improved, and frost is probably less frequent. The SBSdw1 occurs east of the SBPSmk where precipitation amounts increase slightly, and the SBSdw2 occurs north of the SBPSmk where precipitation amounts are similar. The **MSxk** occurs at higher elevations in the most southern area near Bonaparte Lake, while the **SBSmc1** occurs at higher elevations near Timothy Lake.

In the north-central portion of the Cariboo Forest Region, the **SBSdw2** occurs at elevations below the SBPSmk, and either the **SBSmc2** or **MSxv** occur at higher elevations. The SBSmc2 occurs above the SBPSmk in the wettest portions of its distribution, while the MSxv occurs in drier portions. In the Baker Creek and Snaking River basins, which are apparently large cold air accumulation areas, the **SBPSdc** occurs in frost-prone areas below the SBPSmk.

In the **IDFdk3**, zonal sites have:
- Douglas-fir–dominated climax forests (Douglas-fir is predominant tree regeneration);
- timber milk-vetch;
- no bunchberry or black huckleberry.

Distribution of SBPSmk Subzone in the Cariboo Forest Region


Nazko
Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton

In the **SBSdw1** and **SBSdw2**, zonal sites have:
- sarsaparilla, thimbleberry, trailing raspberry, and highbush-cranberry;
- Douglas-fir very common, often dominating the canopy in seral stands.

In the **SBSmc1** and **SBSmc2**, zonal sites have:
- five-leaved bramble, queen's cup, rosy twistedstalk, or bluejoint;
- subalpine fir very common, often present in canopy;
- little or no pinegrass (cover usually <5%).

In the **MSxk**, zonal sites have:
- grouseberry;
- uncommon trembling aspen;
- many vegetation similarities to the SBPSmk.

In the **MSxv**, zonal sites have:
- grouseberry or crowberry;
- little or no pinegrass (cover usually <5%).

In the **SBPSdc**, zonal sites have:
- short-awned ricegrass or spike-like goldenrod;
- no black huckleberry;
- much less common Douglas-fir.

wetter sites have:
- occasional black spruce.

Site Units of the SBPSmk

Zonal Site Series **01 Pl - Pinegrass - Arnica Site Series** dominates the SBPSmk landscape. These sites are generally level to gently sloping and vegetated by even-aged lodgepole pine forests with sparse densities of lodgepole pine, hybrid white spruce, and rarely subalpine fir regeneration. Douglas-fir is occasionally present in the canopy and regeneration layers. Stands occur as a patchwork of age classes and densities, depending upon fire history. Small aspen stands occur locally. The undergrowth is dominated by pinegrass, bunchberry, twinflower, and a thick carpet of feathermosses (especially red-stemmed feathermoss). Shrubs (especially prickly rose, birch-leaved spirea, and black huckleberry) are common but mostly less than 30 cm tall.

Drier Sites Sites drier than mesic are uncommon on the low-relief portion of the subzone. They are moderately common on the more hilly terrain in the Bonaparte Lake and Blackwater River areas. Most dry sites occur on upper and crest slope positions and steep mid slope positions. Dry sandy or gravelly soils are uncommon. The vegetation of drier sites is distinguished by abundant kinnikinnick and the frequent occurrence of Douglas-fir.

02 Pl - Cladonia - Haircap moss Site Series includes small sites on the crests and upper slopes of hills and ridges where bedrock is near (<50 cm) the soil surface. The mature forest canopy is dominated by lodgepole pine, usually with an open, patchy canopy cover. Douglas-fir is frequently present. The undergrowth is dominated by dryland shrubs, patches of mosses, and cladonia and cladina lichens. Abundant cladonia and cladina lichens distinguish the vegetation. Grasses and forbs have a relatively low cover, and exposed mineral soil and rock is common. Principal shrubs are common juniper, saskatoon, and birch-leaved spirea. Principal mosses are haircap moss and wavy-leaved moss.

03 Fd - Pinegrass - Aster Site Series occurs on mid to upper slope positions of steep (>35%) south-facing slopes. Douglas-fir is common on these sites, probably because summer frost is relatively infrequent. The mature forest canopy is typically open and patchy and dominated by Douglas-fir trees of a range of sizes and ages. Large veteran trees are common. Douglas-fir also dominates tree regeneration layers. The undergrowth vegetation typically has a moderate to high cover of pinegrass and showy aster. Scattered low shrubs are present, especially common juniper and birch-leaved spirea. Cover of mosses and lichens is relatively sparse, and exposed mineral soil is common. Douglas-fir dominance of the canopy and regeneration layers and the absence of a well-developed moss layer distinguishes the vegetation of these sites.

04 Pl - Pinegrass - Feathermoss Site Series occurs on a range of sites that are only slightly drier than the /01 site series. They occur on upper and crest slope positions with deep soils, gentle south-facing slopes, and sandy soils. The mature forest canopy is dominated by even-aged lodgepole pine. Tree regeneration layers are usually sparse and predominantly Douglas-fir or hybrid white spruce. The undergrowth vegetation includes a feathermoss carpet (especially red-stemmed feathermoss), abundant pinegrass and dwarf shrubs, and a moderate cover of low shrubs. Abundant velvet-leaved blueberry or kinnikinnick distinguishes the vegetation from other sites. Prickly rose and soopolallie are common low shrubs.

05 SxwFd - Step moss Site Series occurs on mid and upper slope positions of steep (>35%) north- or east-facing slopes. These are moderately dry but cool sites with infrequent summer frost due to the steep slopes. The forest canopy is dominated by Douglas-fir or lodgepole pine, often with a significant component of hybrid white spruce, especially in the regeneration layers. In contrast to the vegetation of other site series, the undergrowth vegetation has a relatively sparse cover of shrubs and herbaceous plants but a nearly continuous carpet of feathermosses, primarily step moss and red-stemmed feathermoss. A relatively small cover of pinegrass is usually present.

Wetter Sites Sites wetter than mesic are common in the low-relief, poorly drained portions of the SBPSmk where wetlands are also common. In areas of greater relief, they occur on lower and toe slope positions, at the perimeter of stream channels and wetlands, and in local depressions. In contrast to mesic and drier sites, hybrid white spruce often dominates the forest canopy. The undergrowth is distinguished from mesic and drier sites by black twinberry, common mitrewort, trailing raspberry, and palmate coltsfoot.

06 Sxw - Twinberry Site Series is the most common site series of the SBPSmk that is wetter than /01 sites. It occurs on lower and toe slope positions and on broad, level areas with poorly developed drainage systems. These sites have relatively cold soils and frequent summer frost beneath canopy openings. The mature forest canopy is dominated by hybrid white spruce or a mixture of lodgepole pine and spruce. Subalpine fir is often present, especially in tree regeneration layers with spruce. Several forbs are present but pinegrass cover is sparse. Low shrubs have a moderate cover and include black twinberry, prickly rose, and highbush-cranberry. The undergrowth vegetation is distinguished by black twinberry, common mitrewort, trailing raspberry, and palmate coltsfoot, and by the absence of common horsetail, soft-leaved sedge, and scrub birch.

07 Sxw - Horsetail - Glow moss Site Series occurs in wet depressions and on wet sites at the toe of slopes where a water table or persistent seepage is present within 50 cm of the soil surface. Soils are typically gleyed or distinctly mottled, or are thin organic soils. The mature forest canopy is dominated by relatively short hybrid white spruce. Subalpine fir and lodgepole pine are sometimes present. A moderate to high cover of shrubs is present and dominated by black twinberry, prickly rose, and black huckleberry. The herbaceous layer is distinguished by abundant common horsetail and the presence of soft-leaved sedge.

08 SbSxw - Scrub birch - Sedge Site Series is a forested wetland that occurs in very wet depressions where a water table is present within 30 cm of the soil surface. Soils are often organic. The forest canopy is relatively open and dominated by short (<15 m) black spruce or hybrid white spruce. Low shrubs have a moderate cover, usually including abundant scrub birch. The undergrowth is characterized by abundant soft-leaved sedge and wetland herbaceous species such as marsh cinquefoil and water sedge.

Non-forested Sites Wetlands are very common in the SBPSmk, especially in the low-relief area near McIntosh Lakes. They are predominantly fens, marshes, and swamps. Bogs and shrub-carrs are not common. Very small, localized grasslands occur on some south-facing slopes but they are very uncommon.

Key to Site Units of the SBPSmk

1a. Soils shallow (<50 cm) to bedrock; slope position crest or upper; moisture regime very xeric or xeric; bedrock outcrops common.
SBPSmk/02 Pl - Cladonia - Haircap moss

1b. Soils deeper; slope position variable; moisture regime subxeric or wetter; bedrock outcrops not present.

2a. Slope gradient >35%; soil parent material mostly colluvium.

3a. Slope aspect SE, S, SW, or W (100–280°); total moss cover <50%; nodding onion usually present.
SBPSmk/03 Fd - Pinegrass - Aster

3b. Slope aspect NW, N, NE, or E (281–360°, 0–99°); moss cover nearly continuous; nodding onion generally absent.
SBPSmk/05 SxwFd - Step moss

2b. Slope gradient 0–35%; soil parent material not colluvium.

4a. Moisture regime submesic or mesic; common mitrewort and palmate coltsfoot absent or incidental; pinegrass dominates herb layer.

  5a. Moisture regime submesic; soil texture sand or loamy sand, or slope position upper or crest; kinnikinnick cover >5%; short-awned ricegrass often present.
    SBPSmk/04 Pl - Pinegrass - Feathermoss
      /04a Typic Phase (soil texture not sand)
      /04b Sand Phase (soils sand or loamy sand)

  5b. Moisture regime mesic; soil texture not sand, and site not on upper or crest slope position; cover of kinnikinnick 0–5% (occasionally greater in western parts of subzone); short-awned ricegrass rarely present.
    SBPSmk/01 Pl - Pinegrass - Arnica

4b. Moisture regime subhygric or wetter; common mitrewort and palmate coltsfoot present; pinegrass seldom dominates herb layer.

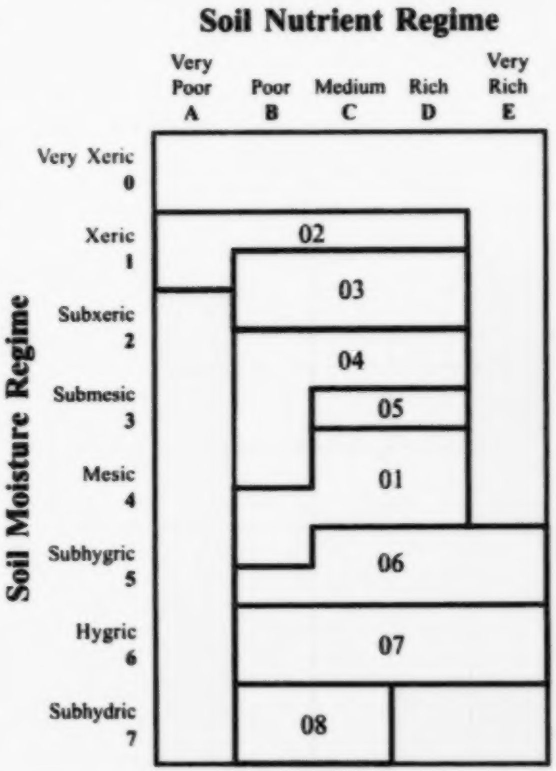
  6a. Moisture regime subhygric; no evidence of persistent seepage or water table within 50 cm of surface; soils often have dull mottles but are not gleyed or organic; pinegrass present; common horsetail, soft-leaved sedge, and sphagnum moss absent or incidental.
    SBPSmk/06 Sxw - Twinberry

  6b. Moisture regime hygric or subhydric; evidence of persistent seepage or water table within 50 cm of surface; mineral soils distinctly mottled or gleyed, or soils organic; pinegrass absent or incidental; common horsetail, soft-leaved sedge, or sphagnum moss present.

    7a. Moisture regime hygric; common horsetail very abundant; scrub birch, Labrador tea, and marsh cinquefoil absent or incidental.
      SBPSmk/07 Sxw - Horsetail - Glow moss

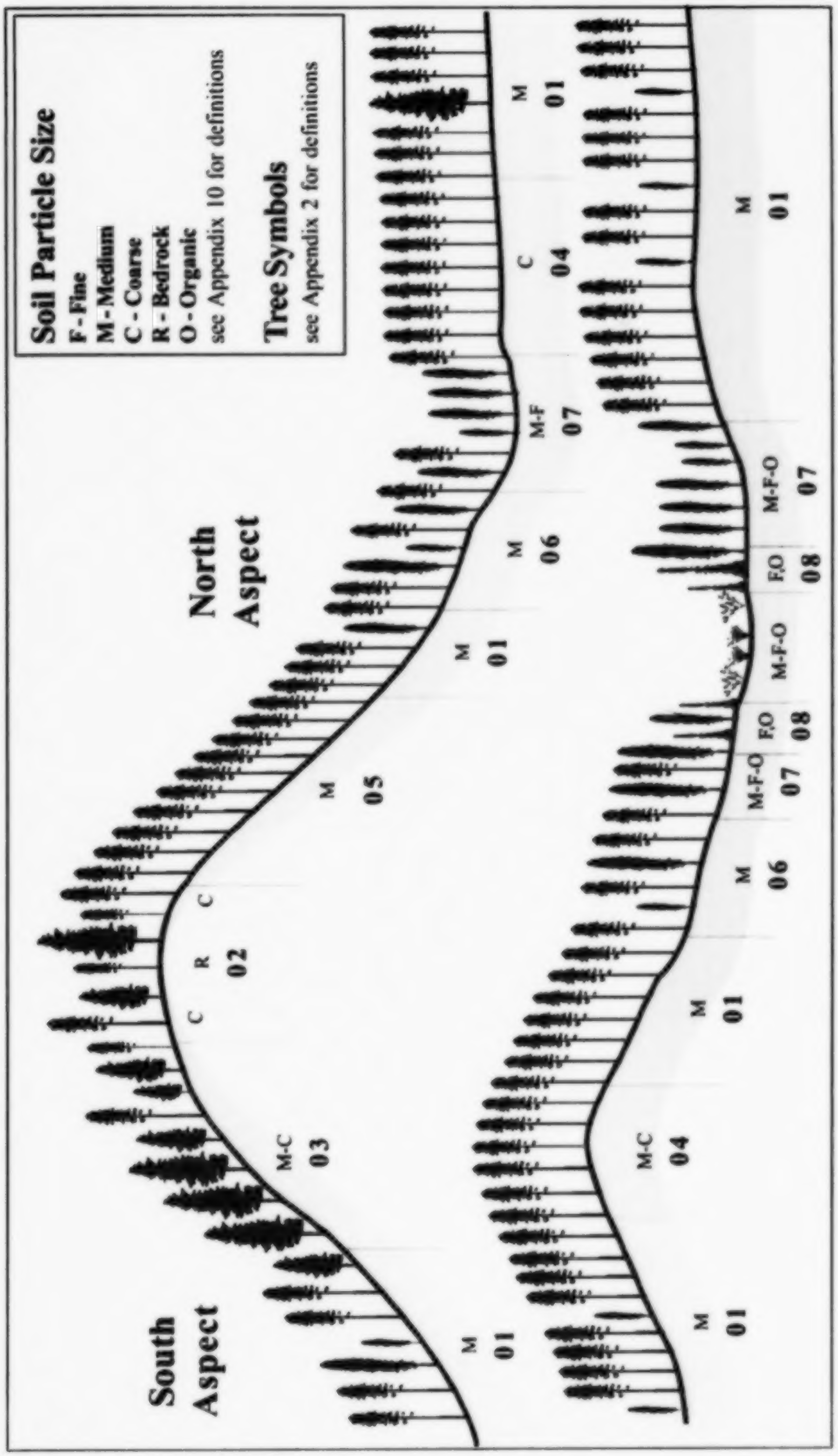
    7b. Moisture regime subhydric; common horsetail present but cover <5%; scrub birch, Labrador tea, and marsh cinquefoil present.
      SBPSmk/08 SbSxw - Scrub birch - Sedge

SBPSmk Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
01
06
07
08

Site	Series
01	Pl - Pinegrass - Arnica
02	Pl - Cladonia - Haircap moss
03	Fd - Pinegrass - Aster
04	Pl - Pinegrass - Feathermoss
05	SxwFd - Step moss
06	Sxw - Twinberry
07	Sxw - Horsetail - Glow moss
08	SbSxw - Scrub birch - Sedge

SBPSmk Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M 01
M-C 03
C
R 02
C
M 05
M 01
M 06
M-F 07
C 04
M 01
M 01
M-C 04
M 01
M 06
M-F-O 07
F,O 08
M-F-O
F,O 08
M-F-O 07
M 01
M 01

Site Features of SBPSmk Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	very dry upper and crest slope positions with shallow (< 50 cm) soils over bedrock	upper to mid slope positions on steep (> 35%) SE-, S-, SW-, and W-facing slopes.	upper and crest slope positions with deep loamy soils (/04a) and level to gently sloping sites with sand soils (/04b)
Soil Moisture / Nutrient Regimes	submesic, mesic (subhygric) / poor - rich	xeric / very poor - rich	xeric, subxeric / poor - rich	subxeric, submesic (mesic) / poor - rich
Slope Position	level, mid	crest, upper	upper (mid)	upper, crest, level
Aspect	all	all	SE, S, SW, W	all
Slope Grade (%)	0 - 35	> 35 on upper slopes; 0 - 15 on crests	> 35	0 - 35
Soil Texture	loamy	gravelly loamy	gravelly loamy	loamy, sand
Soil Humus Form and Thickness (cm)	Hemimor (Mormoder) 3 - 6	Xeromor, Hemimor 0 - 4	Xeromor, Hemimor 1 - 3	Hemimor 3 - 5
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	uncommon / moderate / wide	common / moderate / wide

Site Features of SBPSmk Site Series (continued)

Site Series	05	06	07	08
Key Features	upper and mid slope positions on steep (> 35%) NW-, N-, NE-, or E-facing slopes	moist lower slopes; often adjacent to stream channels or wetlands; intermittent seepage	wet depressions and toe slope positions; water table generally within 30 - 50 cm of surface	very wet depressions; water table usually within 30 cm of surface; forested wetland
Soil Moisture / Nutrient Regimes	submesic / medium, rich	subhygric / poor - very rich	hygric / poor - very rich	subhydric / poor, medium
Slope Position	mid, upper	mid - toe	toe, depression	toe, depression
Aspect	NW, N, NE, E	all	N/A	N/A
Slope Grade (%)	> 35	0 - 15	< 5	< 5
Soil Texture	loamy, sand	loamy	loamy, silty, organic	silty, clayey, organic
Soil Humus Form and Thickness (cm)	Hemimor 3 - 6	Mormoder (Hemimor) 4 - 8	Hydromoder, Hydromor 15 - 40	Hydromor, Hydromoder 15 - 40
Occurrence / Size / Distribution	common / moderate / wide	common / small - moderate / wide	common / small / wide	common / small / wide

SBPSmk Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	
Tree Layer	*Populus tremuloides*		▮							trembling aspen
	Pinus contorta	▮▮▮▮	▮	▮▮▮▮▮		▮▮▮▮▮				lodgepole pine
	Pseudotsuga menziesii		▮▮▮▮▮		▮▮▮▮▮					Douglas-fir
	Picea engelmannii x glauca					▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮	hybrid white spruce
Shrub Layer	*Juniperus communis*	▮▮▮	▮							common juniper
	Spiraea betulifolia	▮▮	▮▮▮	▮	▮▮	▮▮▮				birch-leaved spirea
	Vaccinium membranaceum	▮▮			▮▮	▮▮▮				black huckleberry
	Rosa acicularis	▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		prickly rose
	Shepherdia canadensis		▮	▮▮▮	▮▮▮	▮	▮			soopolallie
	Vaccinium myrtilloides			▮▮▮▮						velvet-leaved blueberry
	Lonicera involucrata					▮	▮▮▮▮	▮▮▮		black twinberry
	Cornus stolonifera							▮▮		red-osier dogwood
	Betula glandulosa								▮▮▮▮	scrub birch
	Ledum groenlandicum								▮▮▮	Labrador tea
Herb Layer	*Allium cernuum*	▮▮	▮▮							nodding onion
	Antennaria neglecta	▮▮	▮▮							field pussytoes
	Viola adunca	▮▮	▮▮							early blue violet
	Vaccinium caespitosum	▮▮		▮▮▮		▮▮▮				dwarf blueberry
	Arctostaphylos uva-ursi	▮▮	▮▮▮	▮▮▮▮	▮▮	▮				kinnikinnick
	Calamagrostis rubescens	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮			pinegrass
	Aster conspicuus		▮▮▮▮	▮	▮▮	▮▮				showy aster
	Chimaphila umbellata			▮▮	▮▮	▮				prince's pine
	Cornus canadensis			▮▮▮▮	▮▮	▮▮▮▮	▮▮▮▮	▮▮▮		bunchberry
	Linnaea borealis			▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	twinflower
	Mitella nuda						▮▮▮	▮▮	▮▮	common mitrewort
	Petasites palmatus						▮▮▮	▮▮		palmate coltsfoot
	Rubus pubescens					▮	▮▮▮	▮▮▮	▮	trailing raspberry
	Carex disperma							▮▮▮	▮▮▮▮▮	soft-leaved sedge
	Equisetum arvense							▮▮▮▮▮	▮▮▮	common horsetail
	Potentilla palustris								▮▮▮	marsh cinquefoil
Moss Layer	*Stereocaulon* spp.	▮▮▮								coral lichens
	Polytrichum juniperinum	▮▮▮▮▮	▮							juniper haircap moss
	Cladina spp.	▮▮▮▮		▮▮			▮			reindeer lichens
	Cladonia spp.	▮▮▮	▮	▮	▮▮					cladonia lichens
	Pleurozium schreberi	▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮	red-stemmed feathermoss
	Dicranum polysetum	▮▮▮	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮			wavy-leaved moss
	Ptilium crista-castrensis		▮		▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮	knight's plume
	Hylocomium splendens				▮▮▮▮▮	▮	▮▮▮▮	▮▮▮▮▮		step moss
	Aulacomnium palustre				▮▮			▮▮▮	▮	glow moss
	Sphagnum spp.							▮	▮▮▮▮▮	sphagnum

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBPSxc
SUB-BOREAL PINE–SPRUCE
VERY DRY COLD SUBZONE

The SBPSxc is the largest subzone of the Sub-Boreal Pine–Spruce Zone (approximately 10 898 km^2), and occurs entirely west of the Fraser River within the Cariboo Forest Region. It is distributed along the leeward side of the Coast Mountains, in an area where the rainshadow effect of the mountains is most pronounced. It extends from approximately Lessard Lake in the northwest to Churn Creek in the southeast. At its eastern limits, it occurs about as far north as Palmer Lake. Elevations are generally 1100–1500 m south of the Chilcotin and Chilanko rivers, and 850–1300 m in more northern areas.

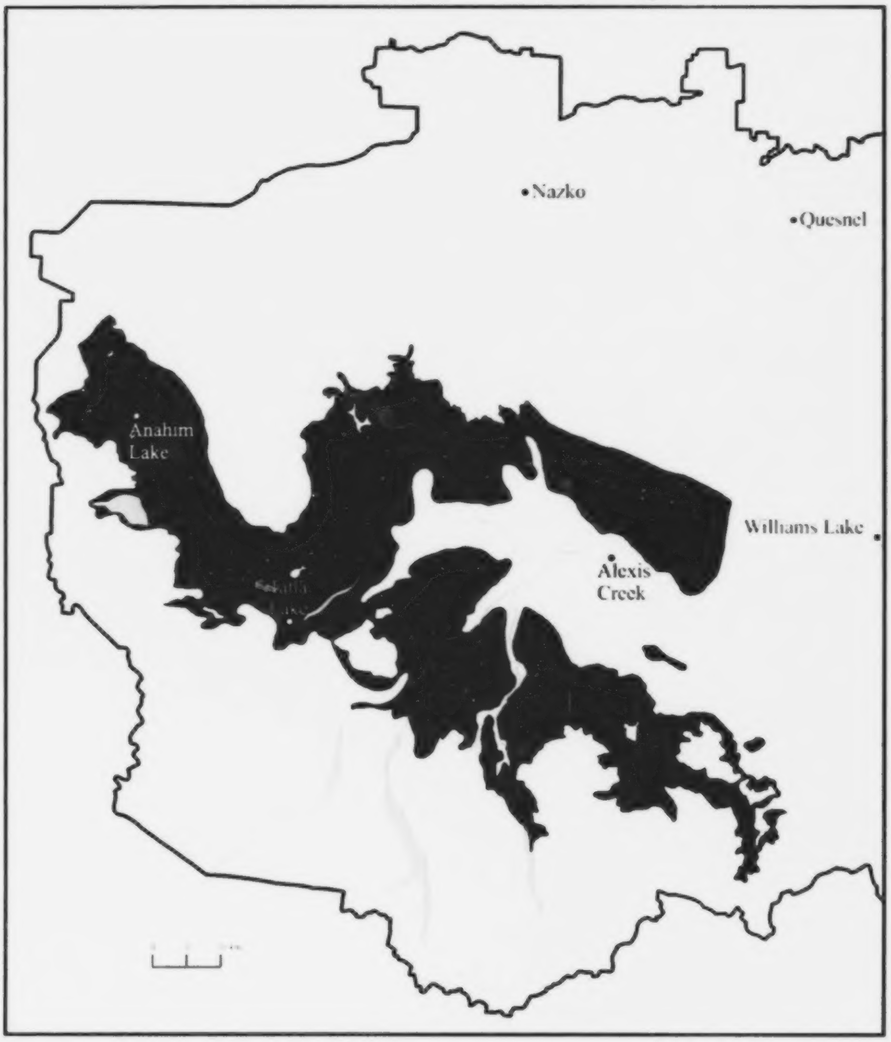
Distinguishing Adjacent Units from the SBPSxc

The **SBPSdc** occurs at similar elevations north of Palmer Lake in eastern portions of the SBPSxc, while the **SBPSmc** occurs at similar elevations north of Lessard Lake in the Dean River valley at the western limits of the SBPSxc. Boundaries between the SBPSxc and both the SBPSdc and SBPSmc are broad. The **MSxv** borders the upper elevations of the SBPSxc throughout most of its range including the high plateau rising toward the Itcha and Ilgachuz mountains and all along the leeward side of the Coast Mountains. The **MSdv** and **MSdc2** occur at higher elevations along very short segments of the SBPSxc border near Taseko Lakes and north of Tsuniah Lake, respectively. The **IDFdk4** occurs at elevations below the SBPSxc throughout most of its range, including the valleys of the Chilcotin, Chilanko, and Taseko rivers and Choelquoit Lake. The **IDFdk3** occurs below the SBPSxc at its northeastern limits near Raven Lake where the climate is comparatively moist and warm.

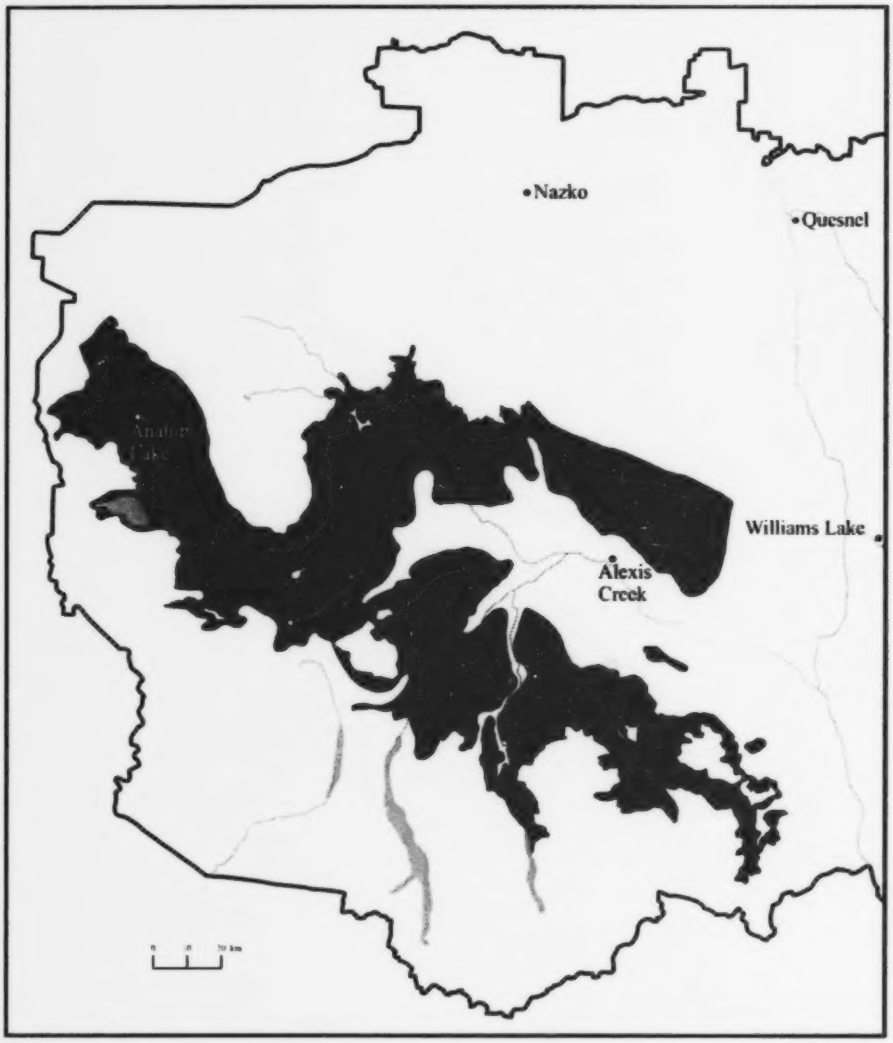
In the **SBPSdc**, zonal sites have:
- moss/lichen layer dominated by feathermosses rather than lichens;
- spruce common in forest canopy and regeneration layers;
- kinnikinnick cover generally <15%;
- more vigorous growth of pinegrass and dwarf blueberry.

In the **SBPSmc**, zonal sites have:
- little or no pinegrass;
- moss/lichen layer dominated by feathermosses rather than lichens;
- spruce common in tree and regeneration layers.

Distribution of SBPSxc Subzone in the Cariboo Forest Region


Nazko
Quesnel
Anahim Lake
Williams Lake
Alexis Creek

Distribution of SBPSxc Subzone in the Cariboo Forest Region


Nazko
Quesnel
Anahim Lake
Williams Lake
Alexis Creek
0 10 20 km

In the **IDFdk4**, zonal sites have:
- Douglas-fir climax forest (Douglas-fir predominant tree regeneration);
- more vigorous pinegrass growth;
- common timber milk-vetch;
- no bunchberry or short-awned ricegrass.

In the **IDFdk3**, zonal sites have:
- Douglas-fir climax forests;
- more vigorous growth of pinegrass;
- common timber milk-vetch;
- moss/lichen layer dominated by feathermosses rather than lichens;
- no bunchberry or short-awned ricegrass.

In the **MSxv**, zonal sites have:
- black crowberry or grouseberry;
- spruce well represented in regeneration layers;
- little or no pinegrass or trembling aspen;
- frequent subalpine fir.

In the **MSdc2** and **MSdv**, zonal sites have:
- subalpine fir;
- moss/lichen layer dominated by mosses rather than lichens;
- minor cover of kinnikinnick.

wetter sites have:
- common black crowberry or grouseberry.

Site Units of the SBPSxc

Zonal Site Series **01 Pl - Kinnikinnick - Feathermoss Site Series** is the predominant site series of the SBPSxc, occurring on upper to lower slope position of most gently sloping sites with medium- and fine-textured soils. The forest canopy is formed of even-aged lodgepole pine in a patchwork of age classes and densities, depending upon fire history. Scattered aspen trees and small aspen stands occur locally but no other tree species are common in the overstory or understory. Lodgepole pine regeneration is sparse to moderately dense, depending upon canopy closure. It is often clumped. Undergrowth vegetation is low-growing and dominated by kinnikinnick, lichens, and patches of pinegrass. Low shrubs, including prickly rose and common juniper, are common but typically have low cover. Common juniper cover increases in old stands. Relatively few vascular species occur, but a rich variety of lichens, primarily *Cladonia* species, are present. Moss cover is sparse.

Drier Sites Sites drier than mesic are common and include sandy soils, south aspects, and upper and crest slope positions. The vegetation of these sites is similar to that of the zonal site series but is distinguished by less abundant pinegrass, greater cover of kinnikinnick, common juniper, and lichens, and typically a more open forest canopy.

02 Pl - Kinnikinnick - Cladonia Site Series includes all sites drier than the /01 site series. Sites with sand or loamy sand textured soils (/02b Sand Phase) are most common, but crest slope positions with shallow (<50 cm) soils over bedrock (/02c Shallow Phase) and steep south- and west-facing slopes (/02a Typic Phase) with deeper soils are also common. The mature forest canopy is relatively open and patchy. Low densities of pine regeneration often occur beneath canopy openings. The undergrowth is dominated by lichens (especially *Cladonia* species), kinnikinnick, and patches of pinegrass. Moss cover is sparse.

Wetter Sites Sites wetter than mesic are generally small and localized. They occur primarily at the fringe of wetlands and along stream channels. Due to the small volumes of seepage water in this subzone, moist seepage sites are uncommon and occur primarily as narrow bands on lowermost slope positions and in small depressions. The vegetation is distinguished from mesic and drier sites by the presence of white spruce, scrub birch, black twinberry, dwarf scouring-rush, palmate coltsfoot, common horsetail, trailing raspberry, or step moss.

03 Sxw - Scrub birch - Fen moss Site Series occurs on gentle lower and toe slope positions at the perimeter of shrub-carrs and some herbaceous wetlands. Sites are often only very slightly (<1 m) elevated above an adjacent shrub-carr. Soils are moist in the spring but surfaces often become dry by mid season. Growing-season frost is very common. The forest canopy is relatively open and dominated by short white spruce and often some lodgepole pine. Tree regeneration is typically sparse. Undergrowth vegetation is distinguished by abundant scrub birch and willows. Kinnikinnick is common but pinegrass is generally absent. Lichens are less abundant than on drier sites.

04 Sxw - Scrub birch - Feathermoss Site Series occurs on lower and toe slope positions, most commonly at the perimeter of herbaceous wetlands and occasionally as a narrow zone upslope of the SBPSxc/03. Growing-season frost is probably less common than in /03 sites. The mature forest canopy is typically closed, and dominated by white spruce and lodgepole pine. Spruce regeneration is common. The undergrowth vegetation is characterized by a moderate cover of low shrubs and a relatively rich variety of forbs. Abundant coltsfoot and black twinberry, but little or no common horsetail or scrub birch, distinguish the vegetation. Shrub cover is generally less than in the /03 site series.

05 Sxw - Horsetail - Glow moss Site Series occurs at the toe of slopes and in depressions with a near-surface (<50 cm) water table. It includes small forested wetlands and wet sites that occur within the forest matrix and, less often, adjacent to non-forested wetlands. The forest canopy is relatively open and dominated by short white spruce trees. Lodgepole pine is uncommon. The undergrowth is a relatively species-rich community dominated by common horsetail but containing several other moist- to wet-site species including trailing raspberry, soft-leaved sedge, and bluejoint. Mosses cover most of the forest floor. The vegetation is distinguished by abundant common horsetail and a smaller cover of black twinberry and northern black currant than in /06 sites.

06 Sxw - Horsetail - Meadowrue Site Series occurs on wet sites adjacent to stream channels where seepage water input is nearly continuous, resulting in moist, relatively nutrient-rich soils. These are the most productive sites for tree growth in the SBPSxc but they are typically small. The forest canopy and tree regeneration layers are dominated by white spruce. The undergrowth includes a moderate cover of shrubs, especially black twinberry. It is distinguished by relatively abundant bunchberry, common mitrewort, soft-leaved sedge, and bluejoint, but a smaller percent cover (<10%) of common horsetail than in /05 sites.

Non-forested Sites Wetlands are very abundant in the SBPSxc and include fens, swamps, marshes, and shallow open water (Roberts 1984). Bogs are present but not common. The wetlands often form large integrated complexes of many wetland types with islands of upland forest. The elevation change between wetland and mesic upland forest may be as little as 1 m. Grasslands are not common in the SBPSxc although small communities dominated by *Stipa* species and timber oatgrass occur locally on some south-facing slopes. Moist meadows, saline meadows, and shrub-carrs are very common at the perimeter of non-forested wetlands, between the wetland and moist forest. The occurrence of these non-forested communities is probably due to growing-season frosts or saline soils, which discourage forest establishment.

Key to Site Units of the SBPSxc

1a. Moisture regime mesic or drier, no evidence of persistent seepage water or water table within 1 m of surface; kinnikinnick cover ≥10%; lichen cover greater than moss cover; spike-like goldenrod usually present; spruce absent or incidental.

  2a. Soils shallow (<50 cm) to bedrock; bedrock commonly exposed; slope position mostly crest or upper.

SBPSxc/02 Pl - Kinnikinnick - Cladonia;
/02c Shallow Phase

  2b. Soils deeper (>50 cm); bedrock not exposed; slope position variable.

    3a. Slope gradient >20% or slope position clearly crest (not including low, subdued crests).

      4a. Slope aspect SE, S, SW, or W (100–290°) or slope position clearly crest.

SBPSxc/02 Pl - Kinnikinnick - Cladonia;
/02a Typic Phase

      4b. Slope aspect NW, N, NE, or E (290–360°, 0–99°) and slope position not clearly crest (if crest, then low, subdued crest).

SBPSxc/01 Pl - Kinnikinnick - Feathermoss

3b. Slope gradient <20% and slope position not clearly crest.

5a. Soil texture sand or loamy sand.
SBPSxc/02 Pl - Kinnikinnick - Cladonia;
/02b Sand Phase

5b. Soil texture loamy, silty, or clayey.
SBPSxc/01 Pl - Kinnikinnick - Feathermoss

1b. Moisture regime subhygric or wetter; evidence of seepage water input or water table within 1 m of soil surface; kinnikinnick cover <10%; moss cover usually greater than lichen cover; spike-like goldenrod usually absent; spruce usually dominates forest canopy.

6a. Moisture regime subhygric; no evidence of persistent seepage water or water table within 50 cm of soil surface; soft-leaved sedge and leafy mosses absent or incidental; lodgepole pine and common juniper usually present.

7a. Scrub birch cover >1% and grey-leaved willow cover usually >5%; tree canopy usually very open.
SBPSxc/03 Sxw - Scrub birch - Fen moss

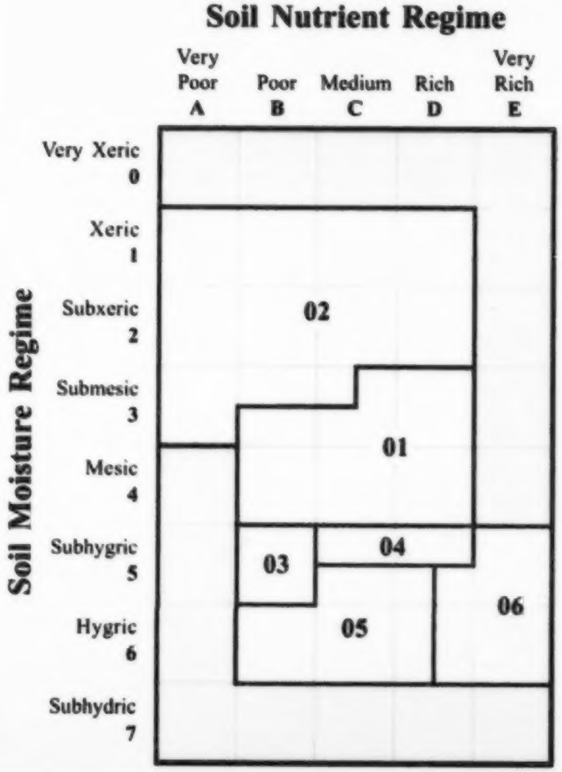
7b. Scrub birch absent or cover <1% and grey-leaved willow cover <5%; tree canopy moderately open to closed.
SBPSxc/04 Sxw - Scrub birch - Feathermoss

6b. Moisture regime subhygric to subhydric; evidence of persistent seepage water or water table within 50 cm of the soil surface; soft-leaved sedge and leafy mosses present; lodgepole pine and common juniper absent or incidental.

8a. Common horsetail cover >10%; combined cover of black twinberry and currant species usually <5%; sites seldom adjacent to permanent streams.
SBPSxc/05 Sxw - Horsetail - Glow moss

8b. Common horsetail cover <10%; combined cover of black twinberry and currant species >5%; sites usually adjacent to streams.
SBPSxc/06 Sxw - Horsetail - Meadowrue

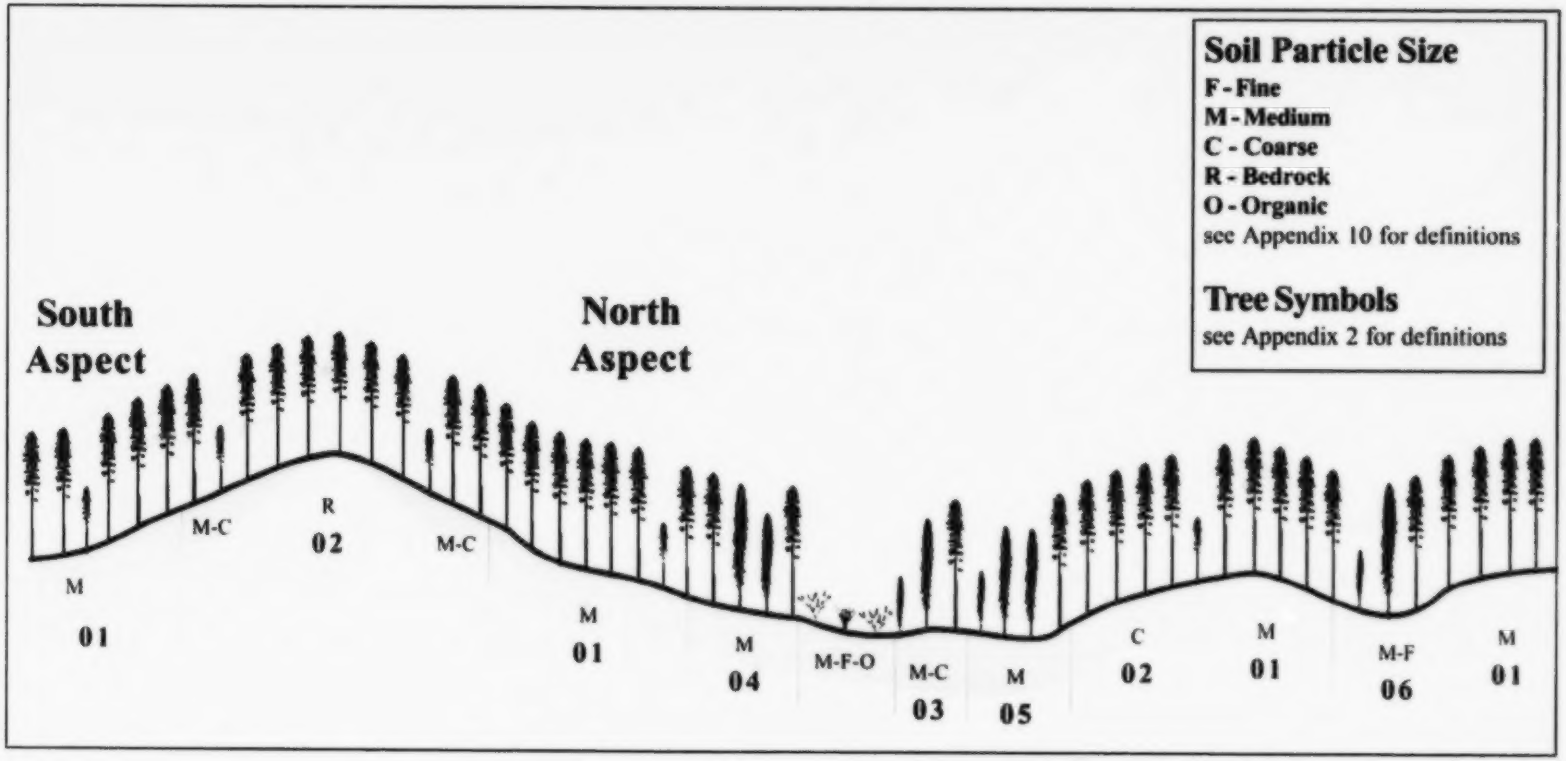
SBPSxc Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
01
03
04
05
06

Site Series

01 Pl - Kinnikinnick - Feathermoss
02 Pl - Kinnikinnick - Cladonia
03 Sxw - Scrub birch - Fen moss
04 Sxw - Scrub birch - Feathermoss
05 Sxw - Horsetail - Glow moss
06 Sxw - Horsetail - Meadowrue

SBPSxc Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M
01
M-C
R
02
M-C
M
01
M
04
M-F-O
M-C
03
M
05
C
02
M
01
M-F
06
M
01

Site Features of SBPSxc Site Series

Site Series	01	02	03
Key Features	zonal and other gently to steeply sloping sites (not steep S or W aspects) with mesic or submesic moisture regime on upper to lower slope positions	wide range of submesic and drier sites: crest slope positions and S- to W- facing slopes > 15% (/02a), gentle slopes with sand soils (/02b), and shallow (< 50 cm) to bedrock soils (/02c)	moist, lower and toe slopes and depressions without persistent near-surface seepage or water table; often at perimeter of shrub-carrs in cold air accumulation basins
Soil Moisture / Nutrient Regimes	submesic, mesic / poor - rich	xeric - submesic / very poor - rich	subhygric / poor
Slope Position	level, mid, lower	crest - mid, level	lower, toe, depression
Aspect	all	all	all
Slope Grade (%)	0 - 30	all (mostly > 15)	0 - 10
Soil Texture	loamy	sand, loamy	loamy, sand
Soil Humus Form and Thickness (cm)	Hemimor, Xeromor 2 - 4	Xeromor 0 - 3, discontinuous	Hemimor 1 - 4
Occurrence / Size / Distribution	predominant / large / wide	very common / medium / wide	uncommon / small-moderate / wide

Site Features of SBPSxc Site Series (continued)

Site Series	04	05	06
Key Features	moist lower slopes with intermittent to persistent seepage but no water table within 50 cm of surface, often adjacent to non-forested wetlands	wet, lower and toe slope positions and depressions, usually with water table within 50 cm of the surface; seldom adjacent to permanent stream	wet sites along permanent streams, persistent seepage and free water usually within 50 cm of surface
Soil Moisture / Nutrient Regimes	subhygric / medium, rich	subhygric, hygric / poor - rich	subhygric, hygric / rich, very rich
Slope Position	lower, toe	(lower) toe, depression	lower, toe, depression
Aspect	all	all	all
Slope Grade (%)	0 - 25	0 - 10	0 - 15
Soil Texture	loamy	loamy, sand, silty	loamy, silty
Soil Humus Form and Thickness (cm)	Hemimor 2 - 10	Hemimor 6 - 20	Hemimor 6 - 20
Occurrence / Size / Distribution	common / small / wide	common / small / wide	uncommon / small / wide

SBPSxc Vegetation Table[a]

	Site Unit	02	01	03	04	05	06	
Tree Layer	*Pinus contorta*	█████	█████		███			lodgepole pine
	Picea glauca			█████	█████	█████	█████	white spruce
Shrub Layer	*Juniperus communis*	███	███	██	██			common juniper
	Shepherdia canadensis	███	███	███	███			soopolallie
	Rosa acicularis	██	███	███	███	███	██	prickly rose
	Salix glauca			████	██	█		grey-leaved willow
	Betula glandulosa			███				scrub birch
	Lonicera involucrata				███	███	████	black twinberry
	Ribes hudsonianum					█	███	northern black currant
Herb Layer	*Oryzopsis pungens*	██	██					short-awned ricegrass
	Solidago spathulata	██	██					spike-like goldenrod
	Arctostaphylos uva-ursi	█████	█████	███				kinnikinnick
	Achillea millefolium	█	██	██	██			yarrow
	Epilobium angustifolium	█	██	██	██	██	██	fireweed
	Fragaria virginiana	██	██	██	███	██	██	wild strawberry
	Linnaea borealis	███	███	███	███	███	███	twinflower
	Galium boreale			██	██	█		northern bedstraw
	Aster ciliolatus			██	██	█	██	fringed aster
	Petasites palmatus			█	███	███	██	palmate coltsfoot
	Equisetum scirpoides			█	██	███	██	dwarf scouring-rush
	Equisetum arvense				██	█████	███	common horsetail
	Cornus canadensis				█	██	███	bunchberry
	Rubus pubescens					███	███	trailing raspberry
	Mitella nuda					█	██	common mitrewort
	Calamagrostis canadensis					███	███	bluejoint
	Carex disperma					███	████	soft-leaved sedge
Moss Layer	*Cladina* spp.	███	███	█				reindeer lichens
	Cladonia spp.	█████	████	█				cladonia lichens
	Peltigera spp.	████	███	███	█			pelt lichens
	Tomenthypnum nitens			███			███	golden fuzzy fen moss
	Pleurozium schreberi		███	█	█████	█	███	red-stemmed feathermoss
	Aulacomnium palustre			█	███	███		glow moss
	Hylocomium splendens			█	█████	█████		step moss
	Peltigera aphthosa		█	█	███	█	██	freckle pelt
	Mnium spp.					███	████	leafy mosses
	Drepanocladus uncinatus						███	sickle moss

[a] Species abundance: █ present in 40–60% of plots surveyed; ██ >60% of plots, mean cover <1%; ███ >60% of plots, mean cover 1–7%; ████ >60% of plots, mean cover >7–15%; █████ >60% of plots, mean cover >15%

A FIELD GUIDE TO FOREST SITE IDENTIFICATION AND INTERPRETATION FOR THE CARIBOO FOREST REGION

O. A. Steen and R. A. Coupé

Ministry of Forests
Research Program

1997

AUTHORS AND AFFILIATIONS

Ordell Steen, Research Ecologist, Cariboo Forest Region, Ministry of Forests, 200 - 640 Borland Street, Williams Lake, B.C. V2G 4T1

Ray Coupé, Research Ecologist, Cariboo Forest Region, Ministry of Forests, 200 - 640 Borland Street, Williams Lake, B.C. V2G 4T1

Canadian Cataloguing in Publications Data
Steen, O. A.
A field guide to forest site identification and interpretation for the Cariboo Forest Region

Includes bibliographical references: p.
ISBN 0-7726-3495-5

1. Bioclimatology – British Columbia – Cariboo Region. 2. Forest site quality – British Columbia – Cariboo Region. 3. Biogeography – British Columbia – Cariboo Region. 4. Forest ecology – British Columbia – Cariboo Region. 5. Forest management – British Columbia – Cariboo Region. 6. Cariboo Forest Region (B. C.). I. Coupé, R., 1952- . II. British Columbia. Ministry of Forests. Research Branch.

QH541.5.F6S73 1998 581.7'37'09711 C98–960063–7

© 1997 Province of British Columbia
Published by the Research Branch, Ministry of Forests, 712 Yates Street, Victoria, B. C. V8W 3E7

Citation:
Steen, O.A and R.A. Coupé. 1997. A field guide to forest site identification and interpretation for the Cariboo Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 39.

Copies of this and other Ministry of Forests titles are available from Crown Publications Inc., 521 Fort Street, Victoria, B.C. V8W 1E7

ACKNOWLEDGEMENTS

The classification and interpretations presented in this field guide have evolved over the past 20 years through the collective work of several individuals involved in the many phases of the Cariboo Forest Region ecological classification project.

W.J. Watt coordinated the ecological classification project in the Cariboo Forest Region from 1977 to 1983. During this time and in subsequent years, he provided important guidance on observation and interpretation of site and soil attributes. Several individuals summarized and interpreted data and developed preliminary ecological classifications and draft ecosystem guides: R. Annas, C. Bowling, B. Coupé, R. Dawson, K. Iverson, L. Lemmen, I. Leung, S. Mah, K. Mayes, P. McAuliffe, R. Meister, N. Stromberg, A. vonSaken, M. Waterhouse, and A. Yee. A. Yee contributed very significantly towards the development of initial approaches to ecological classification and description in the Cariboo Forest Region. In addition to these individuals, many others collected field data from the more than 3000 plots that form the basis of the classification in this guide. A. Roberts, F. Boas, and W. Noble identified difficult vascular, bryophyte, and lichen specimens.

This field guide is based on the provincially correlated ecological classification made possible by the Ministry of Forests Ecological Classification Correlation Program. D. Meidinger directed this correlation effort and worked closely with all forest regions in the provincial synthesis of ecological classification data. We have benefited from his enthusiasm, technical insights, and supportive role. T. Fleming, S. Mah, C. Cadrin, A. Inselberg, and K. Yearsley provided data analyses and interpretations for the provincial correlation project. D. Lloyd, C. DeLong, F. Nuszdorfer, A. Banner, and others helped to resolve correlation and mapping issues between the Cariboo and other forest regions.

The format and content of this guide have benefited greatly from guides to ecosystems for other forest regions in British Columbia. Many of the site and soil description aids in the appendices have been adapted from these other regional guides. The text of sections 1–3 has been modified from text prepared by T. Braumandl, R. Green, C. DeLong, A. Banner, and D. Meidinger.

Forest health information in Section 7 was provided by L. Rankin. An initial draft of the silviculture considerations tables was modified and further developed with input from several experienced silviculturists in the Cariboo Forest Region. We thank A. Randall, K. Day, P. Hendrix, C. Gibson-Robertson, M. Seilis, D. Harris, D. Greeley, G. White, A. Lacourcier, T. Harding, C. von Hahn, W. Nuyens, K. Peel, G. McIntosh, M. Rungi, N. Daintith, T. Newsome, and the others who contributed to this section.

D. Meidinger made many valuable review comments and suggestions for all sections of the guide. Other valuable review comments were provided by A. MacKinnon, A. Banner, T. Braumandl, E. Hamilton, J. McClarnon, N. Daintith, T. Newsome, and P. Nystedt.

We thank B. Hammerstron of Image House Inc. in Williams Lake for his creativity and very important role in the technical production aspects of this guide.

P. Nystedt and others of the Production Resources Group of the Ministry of Forests Research Branch provided very important assistance in developing the presentation format of this guide and facilitating many aspects of its final production. S. Smith did the English edit.

Plant illustrations by the following artists have been used in the guide: F.L. Beebe, G. Bishop, T.C. Brayshaw, M. Bryant, P. Drukker-Brammall, P. Frank, G.F. Harcombe, A. Hassen, S. Mitchell, B.C. Newton, S.D. Salkeld, E.J. Stephen, and R.A. With. We thank the Royal British Columbia Museum and the British Columbia Ministry of Environment, Lands and Parks for permission to use plant illustrations from their publications.

To all others who provided advice or logistical support in the many phases of this project we extend our thanks.

TABLE OF CONTENTS

AUTHORS AND AFFILIATIONS ii

ACKNOWLEDGEMENTS iii

PART 1

1 INTRODUCTION .... 1 - 1

Objectives and Scope .... 1 - 1
Other Sources of Information .... 1 - 2
Guide Contents and Limitations .... 1 - 3
Format of the Guide .... 1 - 4
Training .... 1 - 4

2 BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION SYSTEM .... 2 - 1

Ecosystems .... 2 - 1
Synopsis of BEC System .... 2 - 1
Vegetation Classification .... 2 - 2
Climatic (Zonal) Classification .... 2 - 2
Site Classification .... 2 - 6
Seral Classification .... 2 - 8

3 PROCEDURES FOR SITE DESCRIPTION AND IDENTIFICATION .... 3 - 1

Identifying Biogeoclimatic Units .... 3 - 2
Describing and Identifying Site Units .... 3 - 3

4 ENVIRONMENT OF THE CARIBOO FOREST REGION .... 4 - 1

Physiography .... 4 - 1
Climate .... 4 - 4
Vegetation and Soils .... 4 - 6

5 BIOGEOCLIMATIC UNITS OF THE CARIBOO FOREST REGION .... 5•1 - 1
Introduction .... 5•1 - 1

AT - Alpine Tundra Zone .... 5•2 - 1
BG - Bunchgrass Zone .... 5•3 - 1
CWH - Coastal Western Hemlock Zone .... 5•4 - 1
ESSF - Engelmann Spruce–Subalpine Fir Zone .... 5•5 - 1
ICH - Interior Cedar–Hemlock Zone .... 5•6 - 1
IDF - Interior Douglas-fir Zone .... 5•7 - 1
MS - Montane Spruce Zone .... 5•8 - 1
MH - Mountain Hemlock Zone .... 5•9 - 1
SBPS - Sub-Boreal Pine–Spruce Zone .... 5•10 - 1
SBS - Sub-Boreal Spruce Zone .... 5•11 - 1

6 SITE UNITS OF THE CARIBOO FOREST REGION .. 6•1 - 1

Guide to Site Unit Descriptions .... 6•1 - 1
AT - Alpine Tundra Zone .... 6•2 - 1
BGxh3 - BG Very Dry Hot Subzone, Fraser Variant .... 6•3 - 1
BGxw2 - BG Very Dry Warm Subzone, Alkali Variant .... 6•4 - 1
CWH - Coastal Western Hemlock Zone .... 6•5 - 1
ESSFdc2 - ESSF Dry Cold Subzone, Thompson Variant .... 6•6 - 1
ESSFmv1 - ESSF Moist Very Cold Subzone, Nechako Variant .... 6•7 - 1
ESSFwc3 - ESSF Wet Cold Subzone, Cariboo Variant .... 6•8 - 1
ESSFwk1 - ESSF Wet Cool Subzone, Cariboo Variant .... 6•9 - 1
ESSFxc - ESSF Very Dry Cold Subzone .... 6•10 - 1
ESSFxv1 - ESSF Very Dry Very Cold Subzone, West Chilcotin Variant .... 6•11 - 1
ESSFxv2 - ESSF Very Dry Very Cold Subzone, Big Creek Variant .... 6•12 - 1
ICHdk - ICH Dry Cool Subzone .... 6•13 - 1
ICHmk3 - ICH Moist Cool Subzone, Horsefly Variant .... 6•14 - 1
ICHmw3 - ICH Moist Warm Subzone, Thompson Variant 6•15 - 1
ICHwk2 - ICH Wet Cool Subzone, Quesnel Variant .... 6•16 - 1
ICHwk4 - ICH Wet Cool Subzone, Cariboo Variant .... 6•17 - 1
IDFdk1 - IDF Dry Cool Subzone, Thompson Variant .... 6•18 - 1
IDFdk3 - IDF Dry Cool Subzone, Fraser Variant .... 6•19 - 1
IDFdk4 - IDF Dry Cool Subzone, Chilcotin Variant .... 6•20 - 1
IDFdw - IDF Dry Warm Subzone .... 6•21 - 1
IDFmw2 - IDF Moist Warm Subzone, Thompson Variant 6•22 - 1
IDFxm - IDF Very Dry Mild Subzone .... 6•23 - 1
IDFxw - IDF Very Dry Warm Subzone. .... 6•24 - 1

MHmm2 - MH Moist Maritime Subzone,
Leeward Variant .... 6•25 - 1
MSdc2 - MS Dry Cold Subzone, Tatlayoko Variant .... 6•26 - 1
MSdv - MS Dry Very Cold Subzone .... 6•27 - 1
MSxk - MS Very Dry Cool Subzone .... 6•28 - 1
MSxv - MS Very Dry Very Cold Subzone .... 6•29 - 1
SBPSdc - SBPS Dry Cold Subzone .... 6•30 - 1
SBPSmc - SBPS Moist Cold Subzone .... 6•31 - 1
SBPSmk - SBPS Moist Cool Subzone .... 6•32 - 1
SBPSxc - SBPS Very Dry Cold Subzone .... 6•33 - 1

PART 2

SBSdw1 - SBS Dry Warm Subzone, Horsefly Variant .... 6•34 - 1
SBSdw2 - SBS Dry Warm Subzone, Blackwater Variant ... 6•35 - 1
SBSmc1 - SBS Moist Cold Subzone, Moffat Variant .... 6•36 - 1
SBSmc2 - SBS Moist Cold Subzone, Babine Variant .... 6•37 - 1
SBSmh - SBS Moist Hot Subzone .... 6•38 - 1
SBSmm - SBS Moist Mild Subzone .... 6•39 - 1
SBSmw - SBS Moist Warm Subzone .... 6•40 - 1
SBSwk1 - SBS Wet Cool Subzone, Willow Variant .... 6•41 - 1

7 **SILVICULTURE CONSIDERATIONS**[1] .... 7•1 - 1

Background. .... 7•1 - 1
ESSFwc3 - ESSF Wet Cold Subzone, Cariboo Variant .... 7•8 - 1
ESSFwk1 - ESSF Wet Cool Subzone, Cariboo Variant .... 7•9 - 1
ESSFxv1 - ESSF Very Dry Very Cold Subzone,
West Chilcotin Variant .... 7•11 - 1
ICHdk - ICH Dry Cool Subzone .... 7•13 - 1
ICHmk3 - ICH Moist Cool Subzone, Horsefly Variant ..... 7•14 - 1
ICHwk2 - ICH Wet Cool Subzone, Quesnel Variant .... 7•16 - 1
ICHwk4 - ICH Wet Cool Subzone, Cariboo Variant .... 7•17 - 1
IDFdk3 - IDF Dry Cool Subzone, Fraser Variant .... 7•19 - 1
IDFdk4 - IDF Dry Cool Subzone, Chilcotin Variant .... 7•20 - 1
IDFxm - IDF Very Dry Mild Subzone .... 7•23 - 1
IDFxw - IDF Very Dry Warm Subzone .... 7•24 - 1
MSxv - MS Very Dry Very Cold Subzone .... 7•29 - 1

---

[1] Subsection numbers are the same as for the equivalent biogeoclimatic unit in Section 6. Missing subsections indicate biogeoclimatic units for which silviculture considerations have not yet been prepared.

SBPSdc - SBPS Dry Cold Subzone .... 7•30 - 1
SBPSmk - SBPS Moist Cool Subzone .... 7•32 - 1
SBPSxc - SBPS Very Dry Cold Subzone .... 7•33 - 1
SBSdw1 - SBS Dry Warm Subzone, Horsefly Variant .... 7•34 - 1
SBSdw2 - SBS Dry Warm Subzone, Blackwater Variant ... 7•35 - 1
SBSmc1 - SBS Moist Cold Subzone, Moffat Variant .... 7•36 - 1
SBSmc2 - SBS Moist Cold Subzone, Babine Variant .... 7•37 - 1
SBSmh - SBS Moist Hot Subzone .... 7•38 - 1
SBSmw - SBS Moist Warm Subzone .... 7•40 - 1
SBSwk1 - SBS Wet Cool Subzone, Willow Variant .... 7•41 - 1

8 **LITERATURE CITED** .... 8 - 1

APPENDICES

1 Equivalence of current provincially correlated BEC codes and the pre-correlation classification codes for ecosystems in the Cariboo Forest Region .... A•1 - 1
2 Tree species codes and symbols .... A•2 - 1
3 Ecoregion classification of the Cariboo Forest Region .... A•3 - 1
4 Relative soil moisture regime identification key .... A•4 - 1
5 Actual soil moisture regime relationship to relative soil moisture regime and biogeoclimatic unit .... A•5 - 1
6 Soil nutrient regime identification .... A•6 - 1
7 Guide to identification of surficial geological materials .... A•7 - 1
8 Guide to the common rock types of the Cariboo Forest Region .... A•8 - 1
9 Guide to field soil texturing .... A•9 - 1
10 Soil particle size classification .... A•10 - 1
11 Guide to the identification of soil orders and great groups .... A•11 - 1
12 Characteristics of humus form orders .... A•12 - 1
13 Common and scientific names of plant species mentioned in this guide .... A•13 - 1
14 Comparison charts for visual estimation of foliage cover .... A•14 - 1
15 Description of vegetation subcomplexes listed in silviculture considerations tables .... A•15 - 1

TABLES

1 Subzone name codes .... 2 - 5
2 Important site and soil features for identifying site units .... 3 - 4
3 Environmental characteristics of BG subzones in the Cariboo Forest Region .... 5•3 - 2
4 Environmental characteristics of ESSF subzones and variants in the Cariboo Forest Region .... 5•5 - 2
5 ESSF vegetation table - zonal sites .... 5•5 - 6
6 Environmental characteristics of ICH subzones and variants in the Cariboo Forest Region .... 5•6 - 2
7 ICH vegetation table - zonal sites .... 5•6 - 6
8 Environmental characteristics of IDF subzones and variants in the Cariboo Forest Region .... 5•7 - 2
9 IDF vegetation table - zonal sites .... 5•7 - 5
10 Environmental characteristics of MS subzones and variants in the Cariboo Forest Region .... 5•8 - 2
11 MS vegetation table - zonal sites .... 5•8 - 5
12 Environmental characteristics of SBPS subzones in the Cariboo Forest Region .... 5•10 - 3
13 SBPS vegetation table - zonal sites .... 5•10 - 6
14 Environmental characteristics of SBS subzones and variants in the Cariboo Forest Region .... 5•11 - 2
15 SBS vegetation table - zonal sites .... 5•11 - 6
16 Vegetation potential classes .... 7•1 - 13

FIGURES

1 Location of the Cariboo Forest Region .... 1 - 1
2 Mesoslope position diagram .... 3 - 5
3 Physiographic subdivisions of the Cariboo Forest Region .... 4 - 2
4 Example silviculture considerations table .... 7•1 - 8

SBSdw1
SUB-BOREAL SPRUCE
DRY WARM SUBZONE
HORSEFLY VARIANT

The SBSdw1 extends across the Cariboo Forest Region as a diagonal band from the Lac des Roches area in the southeastern corner of the Region to the confluence of the Blackwater and Fraser rivers in the north-central portion of the Region. It extends for a short distance into both the Kamloops and Prince George forest regions. The SBSdw1 landscape is a gently rolling plateau at elevations from about 750 to 1250 m.

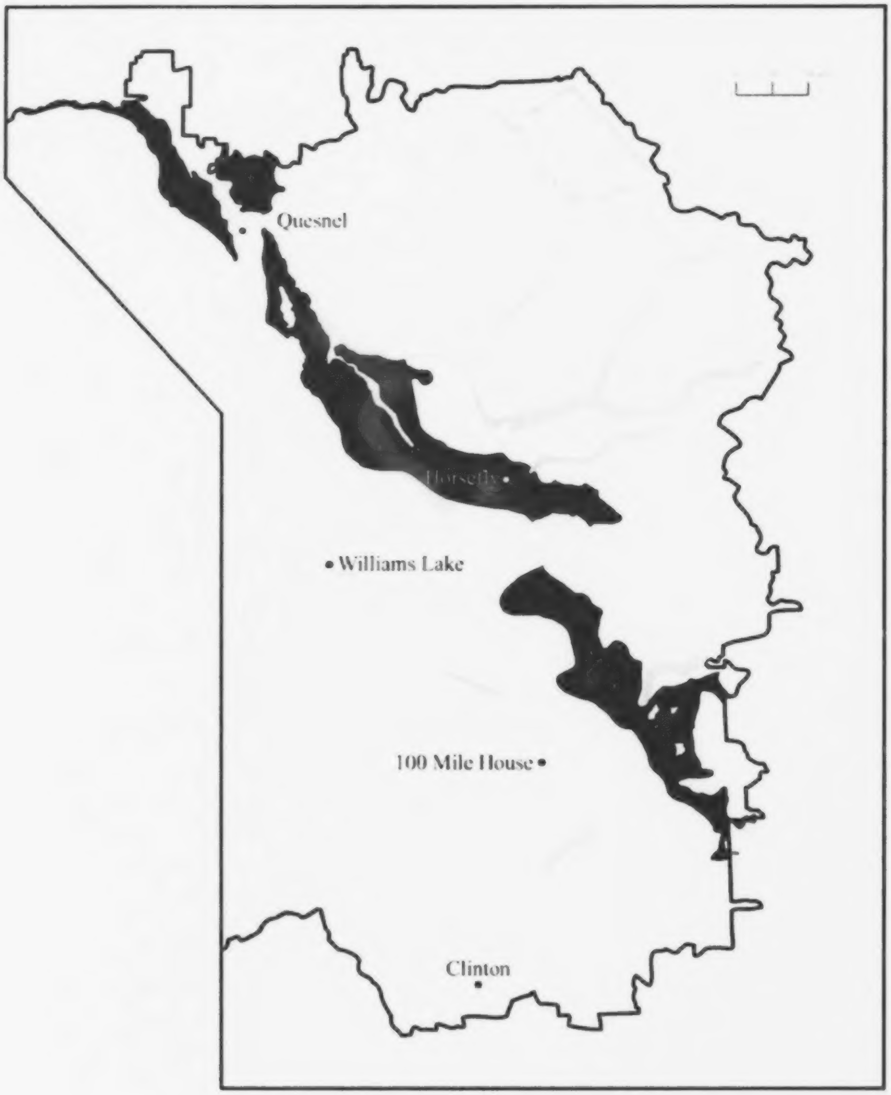
Distinguishing Adjacent Units from the SBSdw1

The **SBSdw2** occurs at similar elevations and on similar terrain west of the SBSdw1 where precipitation amounts are slightly less. The **SBPSmk** occurs at similar elevations but on gentler, lower-relief terrain with poor cold air drainage, west of the SBSdw1. It also borders the upper elevations of the SBSdw1 near the northern limits of the SBSdw1. The **ICHmk3** occurs at similar elevations and on similar terrain east of the SBSdw1 where precipitation is higher due to closer proximity to the Quesnel Highland and Cariboo Mountains. The **ICHdk** occurs at similar elevations near Canim Lake at the south end of the Quesnel Highland where precipitation is greater than in the SBSdw1 but less than in the ICHmk3. The **SBSmw** occurs at similar elevations east of the SBSdw1 in northern parts of the Region where precipitation is increased by proximity to the Quesnel Highland but where temperatures are cooler than in the ICH. The **SBSmh** borders low elevations of the SBSdw1 in the valleys of the Fraser and Quesnel rivers. The **IDFmw2** is a very small unit that borders the SBSdw1 at low elevations in the Canim Lake valley. The **SBSmc1** borders upper elevations of the SBSdw1 throughout most of its distribution east of the Fraser River.

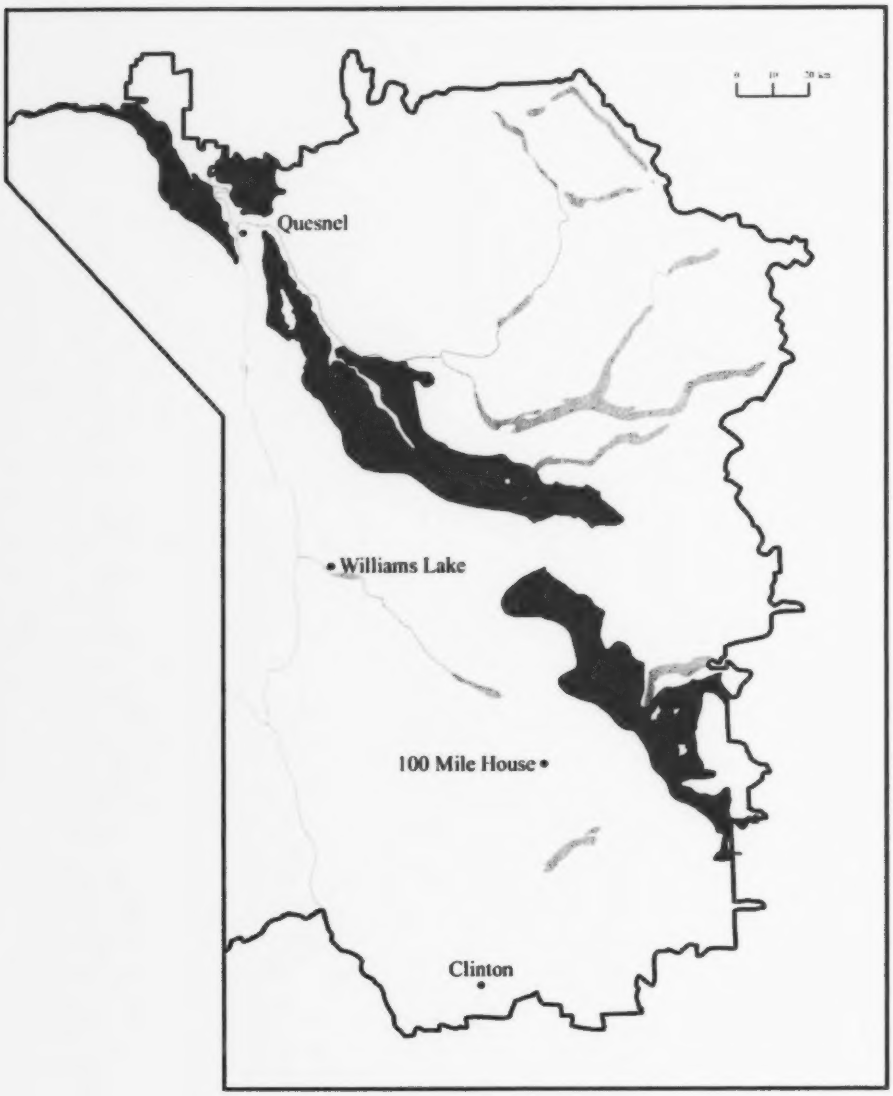
In the **SBSdw2**, zonal sites have:
- little or no falsebox or subalpine fir;
- less diverse shrub layer;
- more abundant pinegrass and occasional kinnikinnick.

In the **SBPSmk**, zonal sites have:
- kinnikinnick;
- no thimbleberry, wild sarsaparilla, trailing raspberry, falsebox, or highbush-cranberry;
- little or no subalpine fir or cat's-tail moss.

Distribution of SBSdw1 Variant in the Cariboo Forest Region


Quesnel
Horsefly
Williams Lake
100 Mile House
Clinton

Distribution of SBSdw1 Variant in the Cariboo Forest Region


0 10 20 km
Quesnel
Williams Lake
100 Mile House
Clinton

In the **ICHmk3** and **ICHdk**, zonal sites have:
- western redcedar in regeneration layers;
- three-leaved foamflower, rosy twistedstalk, and five-leaved bramble;
- little or no pinegrass.

In the **SBSmw**, zonal sites have:
- rosy twistedstalk and one-leaved foamflower;
- occasional five-leaved bramble;
- no pinegrass or blue wildrye.

In the **SBSmh**, zonal sites have:
- beaked hazelnut;
- no pinegrass or black huckleberry;
- little or no lodgepole pine.

In the **IDFmw2**, zonal sites have:
- Douglas-fir as the climax tree species;
- western redcedar in regeneration layers or subcanopy of mature stands.

In the **SBSmc1**, zonal sites have:
- occasional five-leaved bramble;
- subalpine fir common in canopy;
- little or no saskatoon, falsebox, prince's pine, or wild sarsaparilla.

Site Units of the SBSdw1

Zonal Site Series **01 SxwFd - Pinegrass Site Series** dominates the SBSdw1 landscape, occurring on most gentle to moderately steep slopes from upper to lower slope position. Soils are developed primarily in loamy morainal deposits and are primarily Brunisolic Gray Luvisols. The canopy of the climax forest is dominated by hybrid white spruce, together with a significant component of Douglas-fir. However, due to a history of frequent wildfires, most natural stands are less than 150 years old and dominated by Douglas-fir or lodgepole pine. In contrast to the IDF, the Douglas-fir stands are generally even-aged and single-storied. Hybrid white spruce and subalpine fir are principal species in the understory. The undergrowth is characterized by a relatively large number of shrub and herbaceous species and nearly complete vegetation cover. Principal shrub species include thimbleberry, black huckleberry, highbush-cranberry, Sitka alder, and prickly rose. Pinegrass, rough-leaved ricegrass, sarsaparilla, bunchberry, and twinflower dominate the herb layer, while the nearly continuous moss layer is dominated by red-stemmed feathermoss, knight's plume, and electrified cat's-tail moss.

Drier Sites Sites drier than those of the zonal site series occur primarily on steep slopes and on local ridge crests and bedrock outcrops. They account for a small proportion of the landscape. Compared to the /01 site series, the vegetation has more kinnikinnick and less frequent wild sarsaparilla, queen's cup, and trailing raspberry.

02 FdPl - Cladonia Site Series occurs on hilltops and ridge crests where bedrock is near (<50 cm) the surface. It occupies a small proportion of the landscape. The forest canopy is relatively open and dominated by slow-growing Douglas-fir or lodgepole pine. Several dry-forest shrub species are present including saskatoon, birch-leaved spirea, and soopolallie. Herbaceous species cover is relatively sparse overall and patchy. Moss cover is also patchy and incomplete. Abundant soil lichens distinguish the vegetation of this site series.

03 Fd - Saskatoon - Pinegrass Site Series occurs on steep (>30%) south- or west-facing slopes at mid to upper slope positions. It includes the warmest forested sites of the SBSdw1. The mature forest canopy is most often relatively open and dominated by Douglas-fir or occasionally lodgepole pine. It may be single-storied or multi-storied. Several stands have large dominant and codominant Douglas-fir trees and smaller Douglas-fir stems in a wide range of sizes. Low shrubs, especially saskatoon, prickly rose, birch-leaved spirea, and soopolallie, are moderately abundant. A moderate cover of pinegrass, together with twinflower and some rough-leaved ricegrass, dominates the herbaceous layer. Moss cover is patchy. The undergrowth is distinguished from the /06 by relatively abundant saskatoon but sparse thimbleberry.

04 Pl - Pinegrass - Feathermoss Site Series occurs primarily on sandy glaciofluvial soils, especially level terraces. It also occurs on some dry ridge crests with loamy soils. The forest canopy is dominated by lodgepole pine, usually with a minor component of hybrid white spruce or Douglas-fir. Tree regeneration is usually sparse. The undergrowth is distinguished by abundant velvet-leaved blueberry or kinnikinnick. Other common shrubs are soopolallie, saskatoon, and birch-leaved spirea. Pinegrass is usually abundant, and dominates the herb layer. Moss cover is well developed and dominated by red-stemmed feathermoss and wavy-leaved moss.

05 SxwFd - Ricegrass Site Series occurs on steep north- or east-facing slopes. These are relatively dry but cool sites. The mature forest canopy is more closed than that of other dry sites and is typically dominated by even-sized Douglas-fir with a variable component of lodgepole pine and hybrid white spruce. The undergrowth is distinguished by a relatively sparse cover of vascular plants but a well-developed, carpet-like moss layer. Principal moss species are red-stemmed feathermoss, knight's plume, and step moss. A sparse cover of several shrub and herbaceous species is present.

Wetter Sites Wetter sites are small but common, occurring at the base of slopes, on localized seepage areas, and in riparian habitats at the edge of wetlands and streams. Most often dominated by hybrid white spruce, they frequently contain subalpine fir and are distinguished by the presence of oak fern, palmate coltsfoot, common mitrewort, or black twinberry.

06 SxwFd - Thimbleberry Site Series is relatively uncommon, occurring primarily on small moist sites near the base of south- or west-facing slopes. These are warm, moist sites distinguished by very abundant and vigorous thimbleberry as well as the presence of black gooseberry, black twinberry, and red-osier dogwood. Several moist-site herbaceous species are also present. The forest canopy is usually dominated by Douglas-fir with minor spruce and paper birch.

07 Sxw - Twinberry - Coltsfoot Site Series occurs on moist sites with intermittent to persistent seepage and morainal soils. They are relatively common at the base of slopes, on seepage areas, and on moist, low-lying flats. Soils are often mottled, indicating temporary water saturation. The forest canopy is moderately closed, and dominated by hybrid white spruce or, less commonly, by Douglas-fir. The undergrowth has moderately high covers of shrubs (especially black twinberry, prickly rose, and common snowberry) and herbaceous species. These sites are distinguished from drier sites by abundant palmate-leaved coltsfoot and leafy mosses, and sparse pinegrass. They are distinguished from /08 sites by little or no oak fern.

08 Sxw - Twinberry - Oak fern Site Series is similar to the /07 Site Series but typically occurs on finer-textured soils developed primarily in lacustrine or alluvial deposits. It is common in streamside riparian habitats. The vegetation is distinguished from the /07 unit by the presence of oak fern, greater cover of black twinberry, absence of pinegrass, and smaller cover of shrub species other than black twinberry and prickly rose. Hybrid white spruce is the principal species of the forest canopy and understory. Douglas-fir is uncommon.

09 Sxw - Horsetail - Glow moss Site Series includes wet forested depressions and level areas with a near-surface (<50 cm) water table. The soil surface is usually hummocky. The forest canopy is dominated by hybrid white spruce, which is usually widely spaced. Trees and natural regeneration typically occur on raised microsites. The undergrowth is distinguished by abundant common horsetail and soft-leaved sedge. Shrubs, especially black twinberry and red-osier dogwood, form a relatively well-developed shrub layer rooted primarily on raised microsites. Wetter soils between the raised microsites support mostly wet-site forbs and graminoids.

Non-forested Sites The natural landscape of the SBSdw1 is mostly forested. Several small wetlands are present, but cover a relatively small proportion of the landscape. These wetlands are primarily fens, marshes, and swamps. Grasslands are very uncommon and when present are small. They occur primarily on dry, steep, south or west aspects.

Key to Site Units of the SBSdw1

1a. Soils shallow (<50 cm) to bedrock, bedrock outcrops often present; slope position crest or upper; moisture regime very xeric to subxeric.
SBSdw1/02 FdPl - Cladonia

1b. Soils deeper, bedrock outcrops absent; slope position generally not crest except on subdued hills; moisture regime subxeric or wetter.

2a. Slope gradient >30%.

3a. Slope aspect SE, S, SW, or W; carpet-like moss cover not present.

4a. Moisture regime subxeric or submesic, no evidence of significant seepage input; moisture-shedding sites; black gooseberry, red-osier dogwood, black twinberry, and bunchberry usually absent.
SBSdw1/03 Fd - Saskatoon - Pinegrass

4b. Moisture regime mesic or subhygric; evidence of intermittent seepage may be present; moisture-receiving sites; black gooseberry, red-osier dogwood, and black twinberry usually present; bunchberry abundant.
SBSdw1/06 SxwFd - Thimbleberry

3b. Slope aspect NW, N, NE, or E; nearly continuous carpet-like moss layer present.
SBSdw1/05 SxwFd - Ricegrass

2b. Slope gradient 30% or less.

5a. Moisture regime submesic or mesic; slope position upper to lower; seepage inputs intermittent; oak fern, black gooseberry, leafy mosses, and common horsetail absent or incidental (<1% cover).

6a. Soil texture sand or loamy sand; parent materials usually fluvial; velvet-leaved blueberry or kinnikinnick abundant.
SBSdw1/04 Pl - Pinegrass - Feathermoss

6b. Soil texture loamy, silty, or clayey; parent materials usually morainal; velvet-leaved blueberry and kinnikinnick absent or incidental (<1% cover).
SBSdw1/01 SxwFd - Pinegrass

5b. Moisture regime subhygric to subhydric; slope position lower, toe, depression, or level; evidence of persistent seepage water or water table within 1 m of surface; oak fern, black gooseberry, leafy mosses, or common horsetail cover >1%.

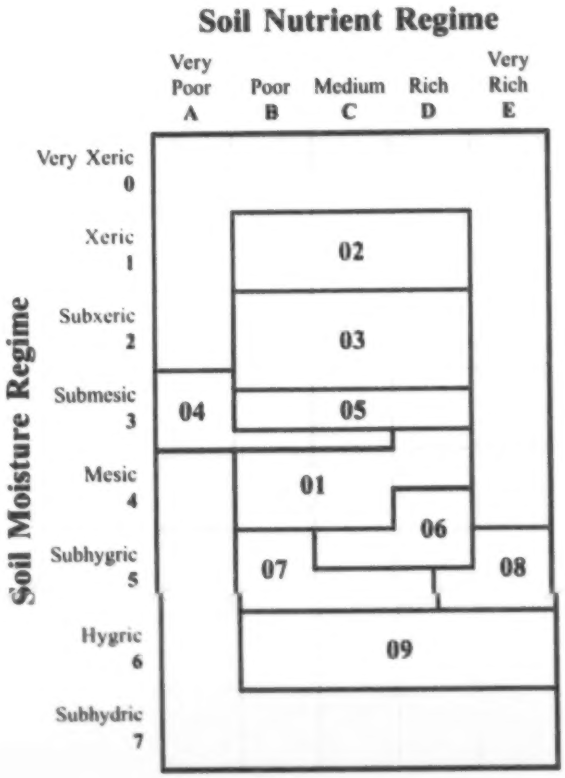
7a. Common horsetail cover >5%; persistent seepage water flow or water table within 30 cm of surface.
SBSdw1/09 Sxw - Horsetail - Glow moss

7b. Common horsetail absent or incidental; no evidence of persistent seepage or water table within 30 cm of surface.

8a. Oak fern cover >5%; soil parent materials usually fluvial or lacustrine.
SBSdw1/08 Sxw - Twinberry - Oak fern

8b. Oak fern absent or scarce; soil parent materials usually morainal.
SBSdw1/07 Sxw - Twinberry - Coltsfoot

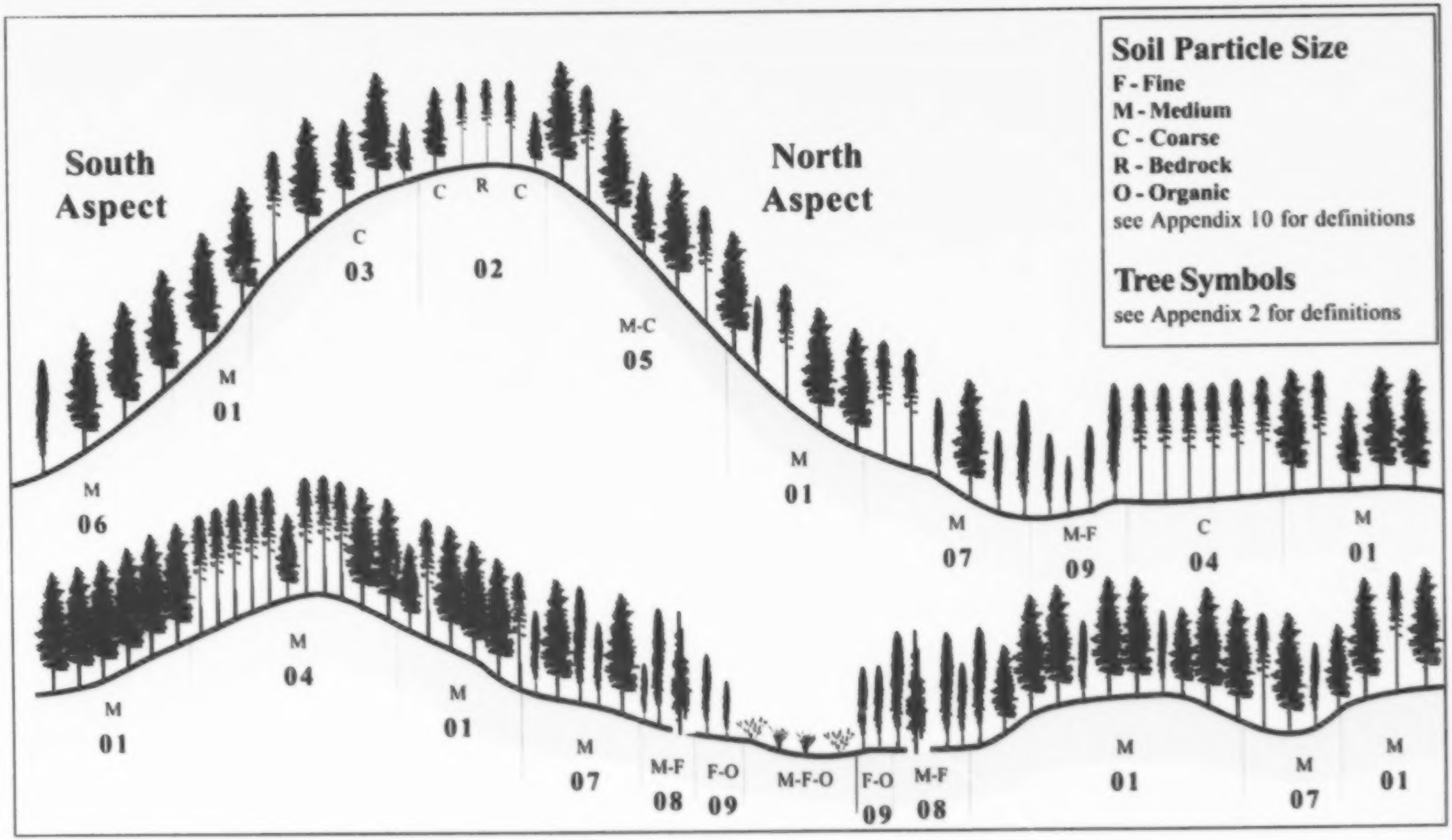
SBSdw1 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
01
06
07
08
09

Site Series

01 SxwFd - Pinegrass
02 FdPl - Cladonia
03 Fd - Saskatoon - Pinegrass
04 Pl - Pinegrass - Feathermoss
05 SxwFd - Ricegrass
06 SxwFd - Thimbleberry
07 Sxw - Twinberry - Coltsfoot
08 Sxw - Twinberry - Oak fern
09 Sxw - Horsetail - Glow moss

SBSdw1 Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M 06
M 01
C 03
C R C
02
M-C 05
M 01
M 07
M-F 09
C 04
M 01
M 01
M 04
M 01
M 07
M-F 08
F-O 09
M-F-O
F-O 09
M-F 08
M 01
M 07
M 01

Site Features of SBSdw1 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	hill crests and ridge tops with shallow (< 50 cm) soils over bedrock	middle and upper slope positions on steep (> 30%) S- and W-facing slopes; loamy soils	gently sloping to level sites with sandy soils; also some dry upper slopes and crests with deep soils; mostly fluvial terraces	steep (> 30%) N- and E-facing slopes with loamy soils
Soil Moisture / Nutrient Regimes	submesic, mesic / poor - rich	xeric / poor - rich	subxeric, submesic / poor - rich	submesic / very poor - medium	submesic / poor - rich
Slope Position	upper - lower	crest (upper)	mid, upper	level (upper, crest)	upper, mid
Aspect	all	all	SE, S, SW, W	all	NW, N, NE, E
Slope Grade (%)	0 - 30	0 - 10 (30)	> 30	< 10	30 - 70; mostly > 40
Soil Texture	gravelly loamy	gravelly loamy	gravelly loamy	sand, gravelly loamy	gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 7	Xeromor (Hemimor) 1 - 4	Xeromor, Hemimor 2 - 6	Hemimor 3 - 7	Hemimor, Mormoder 2 - 6
Occurrence / Size / Distribution	predominant / large / wide	common / small / wide	common / moderate / wide	uncommon / moderate / wide	common / moderate / wide

Site Features of SBSdw1 Site Series (continued)

Site Series	06	07	08	09
Key Features	moist sites near base of S- and W-facing slopes; also on some moist level to gentle slopes with intermittent seepage	moist lower and toe slope positions with gravelly morainal soils; seldom adjacent to streams	moist lower and toe slope positions mostly on alluvial or lacustrine soils; often adjacent to streams	wet toe slope positions and depressions with near-surface (< 50 cm) water table
Soil Moisture / Nutrient Regimes	mesic, subhygric / medium, rich	subhygric / poor - rich	subhygric / rich, very rich	hygric (subhydric) / poor - rich
Slope Position	lower (toe)	lower (middle, toe)	lower, toe, level	toe, depression
Aspect	all, primarily S or W	all	all	N/A
Slope Grade (%)	(5 - 19) 20 - 50	< 15	< 5	< 5
Soil Texture	loamy	gravelly loamy	loamy, silty	loamy, silty, organic
Humus Form and Thickness (cm)	Mormoder, Hemimor 4 - 7	Mormoder 3 - 9	Mormoder 7 - 20	Hydromoder, Hydromor 5 - 40
Occurrence / Size / Distribution	uncommon / small / wide	common / small / wide	uncommon / small / wide	common / small / wide

SBSdw1 Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	09	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮		▮▮▮			lodgepole pine
	Pseudotsuga menziesii	▮▮▮▮	▮▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮			Douglas-fir
	Populus tremuloides					▮		▮▮▮			trembling aspen
	Picea engelmannii x glauca			▮		▮▮▮▮		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
	Betula papyrifera						▮	▮			paper birch
	Abies lasiocarpa					▮			▮▮▮▮	▮	subalpine fir
Shrub Layer	*Vaccinium membranaceum*	▮▮▮		▮	▮▮	▮▮▮					black huckleberry
	Vaccinium myrtilloides			▮▮▮▮▮							velvet-leaved blueberry
	Pachistima myrsinites	▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮	▮			falsebox
	Shepherdia canadensis	▮	▮▮▮	▮▮▮▮	▮	▮	▮▮	▮▮▮			soopolallie
	Rosa acicularis	▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	prickly rose
	Amelanchier alnifolia	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	▮▮	▮▮▮	▮	▮	saskatoon
	Symphoricarpos albus		▮▮▮			▮	▮▮▮	▮▮▮	▮		common snowberry
	Rubus parviflorus				▮	▮▮▮▮	▮▮▮▮▮	▮	▮		thimbleberry
	Cornus stolonifera				▮	▮	▮▮	▮	▮	▮▮▮	red-osier dogwood
	Lonicera involucrata					▮▮	▮	▮▮▮	▮▮▮▮	▮▮▮▮	black twinberry
Herb Layer	*Arctostaphylos uva-ursi*		▮	▮▮▮							kinnikinnick
	Lycopodium complanatum			▮▮▮							ground-cedar
	Calamagrostis rubescens	▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮			pinegrass
	Linnaea borealis	▮▮	▮▮▮	▮▮▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	twinflower
	Oryzopsis asperifolia		▮▮▮	▮▮▮	▮	▮▮	▮▮▮	▮▮▮			rough-leaved ricegrass
	Cornus canadensis			▮▮▮▮	▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	bunchberry
	Aralia nudicaulis		▮		▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮	▮▮▮	wild sarsaparilla
	Rubus pubescens					▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	trailing raspberry
	Clintonia uniflora			▮		▮▮▮	▮	▮▮			queen's cup
	Mitella nuda					▮	▮	▮▮	▮▮	▮▮▮	common mitrewort
	Petasites palmatus							▮▮▮	▮▮	▮▮	palmate coltsfoot
	Gymnocarpium dryopteris								▮▮▮▮▮	▮	oak fern
	Equisetum arvense								▮	▮▮▮▮▮	common horsetail
	Geum rivale									▮▮▮	water avens
	Carex disperma									▮▮▮▮	soft-leaved sedge
Moss Layer	*Peltigera malacea*	▮▮▮									apple pelt
	Polytrichum spp.	▮▮▮					▮				haircap mosses
	Cladina spp.	▮▮▮	▮	▮							reindeer lichens
	Cladonia spp.	▮▮▮	▮▮								cladonia lichens
	Pleurozium schreberi	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Ptilium crista-castrensis	▮▮	▮	▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	knight's plume
	Rhytidiadelphus triquetrus		▮▮		▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮	electrified cat's-tail moss
	Hylocomium splendens				▮▮▮▮	▮	▮▮▮	▮	▮	▮▮▮	step moss
	Mnium spp.						▮	▮▮▮	▮▮▮▮	▮▮▮▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBSdw2
SUB-BOREAL SPRUCE
DRY WARM SUBZONE
BLACKWATER VARIANT

The SBSdw2 is a narrow diagonal band along the west side of the SBSdw1 in the central and northern portions of the Cariboo Forest Region. It does not extend as far south as the SBSdw1 but occurs further northward into the Prince George Forest Region. The SBSdw2 landscape is a gently rolling plateau with elevations ranging primarily from 750 to 1200 m.

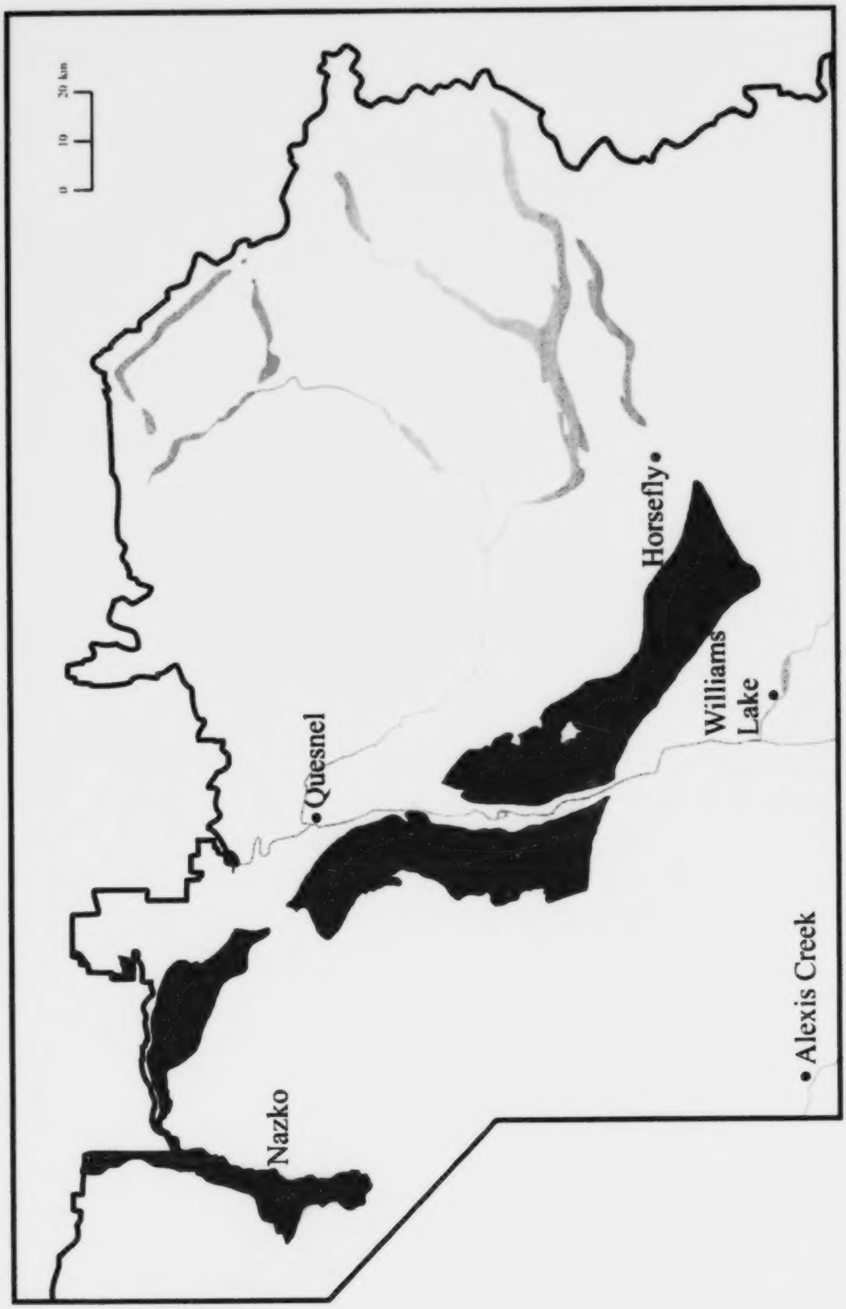
Distinguishing Adjacent Units from the SBSdw2

The **SBSdw1** occurs at similar elevations east of the SBSdw2 where the climate is slightly wetter and warmer. It also borders the lower elevations of the SBSdw2 in the Fraser and Blackwater river valleys. The **IDFdk3** occurs at similar elevations on the plateau south and west of the SBSdw2 where precipitation is less. The **SBPSmk** occurs at similar elevations southeast of the SBSdw2 on the low-relief plateau where cold air drainage is less well developed. It also occurs at higher elevations on the low hills west of the SBSdw2 in the north-central part of the Region. The **SBPSdc** occurs northwest of the SBSdw2 in the Nazko–Euchiniko area where cold air drainage is poor. The **SBSmc1** borders the upper elevations of the SBSdw1 east of the Fraser River, while the **SBSmc2** occurs at higher elevations west of the Fraser River. The **SBSmh** occurs below the SBSdw2 in the Fraser River valley, north of about Alexandria, while the **IDFxm** occurs below the SBSdw2 in the Fraser River valley south of Alexandria.

In the **SBSdw1**, zonal sites have:
- falsebox;
- common subalpine fir, especially in regeneration layers;
- more diverse and higher cover of low shrubs;
- less pinegrass and no kinnikinnick.

In the **IDFdk3**, zonal sites have:
- climax forest dominated by Douglas-fir with little or no spruce (scattered spruce occasionally present near SBS boundary);
- very common kinnikinnick;
- no bunchberry or black twinberry, and little or no knight's plume moss.

Distribution of SBSdw2 Variant in the Cariboo Forest Region


0
10
20 km
Nazko
Quesnel
Horsefly
Williams Lake
Alexis Creek

In the **SBPSmk** and **SBPSdc**, zonal sites have:
- very common kinnikinnick;
- no thimbleberry, wild sarsaparilla, trailing raspberry, or highbush-cranberry;
- little or no electrified cat's-tail moss.

In the **SBSmc1 and SBSmc2**, zonal sites have:
- rosy twistedstalk and one-leaved foamflower;
- occasional five-leaved bramble;
- common subalpine fir in forest canopy;
- little or no saskatoon, prince's pine, or wild sarsaparilla.

In the **SBSmh**, zonal sites have:
- beaked hazelnut;
- no pinegrass or black huckleberry;
- little or no lodgepole pine.

In the **IDFxm**, zonal sites have:
- Douglas-fir as climax tree species;
- no lodgepole pine, bunchberry, wild sarsaparilla, black twinberry, or black huckleberry.

Site Units of the SBSdw2

Zonal Site Series **01 SxwFd - Pinegrass Site Series** is the predominant site series of the SBSdw2 landscape. It occurs on most gentle to moderately steep slopes from upper to lower slope positions. Soils are primarily Luvisols developed in loamy morainal deposits. The old forest canopy is dominated by hybrid white spruce and Douglas-fir but, due to frequent wildfires in the past, stands less than 150 years old are common and have an even-aged Douglas-fir– or lodgepole pine–dominated canopy. Tree regeneration is primarily Douglas-fir and spruce but sometimes includes subalpine fir. The undergrowth has a moderate to high cover of pinegrass, a sparse to moderate cover of low shrubs, and a nearly complete moss cover dominated by red-stemmed feathermoss and knight's plume. Principal shrubs include prickly rose, birch-leaved spirea, and Sitka alder.

Drier Sites Sites drier than those of the zonal site series occur on hill crests, steep slopes, south- and west-facing slopes, and coarse soils. They are moderately common. Compared to zonal and other mesic sites, they have more dry-site shrubs such as common juniper and soopolallie, more frequent kinnikinnick, and little or no black twinberry.

02 FdPl - Cladonia Site Series includes small sites on ridge tops, hill crests, and upper slopes where bedrock is near (<50 cm) the surface and frequently exposed. Overlying soils are thin, typically rocky and dry. The forest canopy is dominated by either Douglas-fir or lodgepole pine. The undergrowth vegetation includes few species and only partially covers the soil surface. Dry-site low shrubs, especially common juniper and birch-leaved spirea, are usually abundant. A sparse cover of pinegrass and low forbs occurs among the shrubs. Lichens, especially cladonia lichens, are relatively abundant and distinguish the vegetation.

03 Pl - Kinnikinnick - Wavy-leaved moss Site Series is uncommon. It includes sites with coarse gravelly sand soils, mostly on gentle to moderately sloping south- or west-facing slopes. The forest canopy is dominated by relatively slow-growing lodgepole pine with hybrid white spruce in the understory. The undergrowth is distinguished from that of the /01 site series by very abundant (>30% cover) kinnikinnick. Other low shrubs, including velvet-leaved blueberry and saskatoon, are scattered throughout the stand, and herbaceous species, including pinegrass and twinflower, have a sparse cover. Wavy-leaved moss and red-stemmed feathermoss dominate the discontinuous moss/ lichen layer.

04 Fd - Pinegrass - Aster Site Series occurs on steep (>30%) south- or west-facing slopes with loamy, silty, or sandy soils. These are hot, dry sites, but available nutrients are probably greater than in the /03 unit. As a result, the mature forest canopy is nearly always dominated by large, relatively open-grown Douglas-fir. Lodgepole pine and trembling aspen are usually present. The undergrowth has a moderate cover of low shrubs, including common juniper, soopolallie, kinnikinnick, and saskatoon. Several herbaceous species are present but total cover of these as well as mosses is low. The vegetation is distinguished by the presence of common juniper and spike-like goldenrod, less kinnikinnick than in the /03 unit, and the absence of step moss and knight's plume.

05 SxwFd - Cat's-tail moss Site Series occurs on steep (>30%) north- and east-facing slopes. On these cool, dry sites the forests are distinguished by a relatively thick, well-developed moss carpet and a relatively low cover of vascular plants. Dominant mosses are step moss, red-stemmed feathermoss, electrified cat's-tail moss, and knight's plume. The forest canopy is typically dominated by either Douglas-fir or hybrid white spruce, with both species present in the regeneration layers. The cover of shrubs and herbaceous plants is generally so sparse that it does not obscure the well-developed moss layer that distinguishes these sites.

06 Pl - Pinegrass - Feathermoss Site Series includes a wide range of submesic sites: level to gently sloping sites with sandy soils, moderately steep (<30%) south-facing slopes with loamy soils, and moderately steep north-facing slopes with sandy soils. The undergrowth vegetation is distinguished from that of other sites by the presence of velvet-leaved blueberry and kinnikinnick, and by relatively abundant step moss. Black spruce is absent and the canopy is dominated by lodgepole pine or Douglas-fir. The undergrowth has a moderate cover of low shrubs, pinegrass, twinflower, and kinnikinnick. Several other species are present but have low cover. The moss layer, dominated by red-stemmed feathermoss and wavy-leaved moss, covers most of the forest floor.

07 PlSb - Feathermoss Site Series occurs on slightly dry to mesic sites in cold air accumulation areas such as valley bottoms and small topographic basins. Soils are typically cold compared to those in surrounding areas. The vegetation is distinguished from that on other mesic or near-mesic sites by black spruce. The forest canopy and tree regeneration layers are primarily black spruce but also often include lodgepole pine and scattered hybrid white spruce. The undergrowth has a well-developed moss cover, and scattered low shrubs and herbaceous species including velvet-leaved blueberry, prickly rose, birch-leaved spirea, pinegrass, and heart-leaved arnica.

Wetter Sites Sites wetter than mesic are moderately common at the toe of slopes, on seepage areas, and adjacent to streams and wetlands. In this relatively dry climate, seepage slopes are generally small and occur primarily on north- or east-facing slopes. Forests on these wetter sites are typically dominated by hybrid white spruce and are distinguished by relatively abundant black twinberry, oak fern, and common horsetail.

08 Sxw - Twinberry Site Series has a localized distribution on moist, gently sloping to level sites at the base of slopes. It is typically in valley bottoms and along stream channels where cold air collects. The forest canopy is typically open, and dominated by hybrid white spruce. Tree regeneration is predominantly hybrid white spruce and is usually sparse. Shrubs, especially black twinberry, are abundant. The herb layer is relatively sparse but contains several species including wild sarsaparilla, common mitrewort, and palmate coltsfoot. The undergrowth vegetation is distinguished by abundant black twinberry and the presence of oak fern, Canada violet, common horsetail, and leafy mosses.

09 Sxw - Devil's club - Knight's plume Site Series is uncommon, occurring locally on moist seepage sites, primarily near the base of north- or east-facing slopes. It does not occur on level sites where cold air accumulates. These are among the most productive sites for forest vegetation in the SBSdw2. The forest canopy is typically a mixture of hybrid white spruce, Douglas-fir, subalpine fir, and paper birch. Tree regeneration is often sparse, due probably to the dense shrub layer. The undergrowth includes a vigorous shrub layer dominated by devil's club, and a diverse herbaceous layer containing oak fern and frequently lady fern. Abundant devil's club distinguishes these sites.

10 Sxw - Horsetail Site Series is common and includes most forested sites in wet depressions with a near-surface (<50 cm) water table. The forest canopy is dominated by relatively open-grown hybrid white spruce, often established on raised microsites. Subalpine fir is commonly present in the subcanopy. The undergrowth is characterized by abundant common horsetail. Shrubs are abundant, especially black twinberry, but highbush-cranberry, red-osier dogwood, and northern black currant are also present. Common herbs in addition to horsetails are common mitrewort, palmate coltsfoot, and trailing raspberry.

11 Sb - Soft-leaved sedge - Sphagnum Site Series includes forested wetlands that occur at the perimeter of non-forested fens and fen-bogs. It typically has a very open forest canopy dominated by short (<15 m), small-diameter black spruce. Hybrid white spruce and lodgepole pine are also often present. The undergrowth is distinguished by the presence of Labrador tea, sphagnum moss, soft-leaved sedge, and common horsetail. Other common wet-site species include water avens, dwarf nagoonberry, and Bebb's willow. Soils are often organic.

Non-forested Sites The natural landscape of the SBSdw2 is mostly forested but includes several small wetlands that are primarily sedge fens, shrub fens, marshes, and swamps. Grasslands are very uncommon and small but can be found on moderate to steep, south and west aspects.

Key to Site Units of the SBSdw2

1a. Soils shallow (<40 cm) to bedrock, bedrock usually exposed; moisture regime very xeric or xeric.
SBSdw2/02 FdPl - Cladonia

1b. Soils deeper, bedrock usually not exposed; moisture regime subxeric or wetter.

2a. Moisture regime subxeric to mesic; site not in moisture-receiving position or if so then soils coarse textured (sand); mountain alder, soft-leaved sedge, common horsetail, and sweet-scented bedstraw absent or incidental (<1% cover).

3a. Slope gradient >30%.

4a. Slope aspect NW, N, NE, or E; moisture regime mesic or submesic; undergrowth dominated by continuous moss cover.
SBSdw2/05 SxwFd - Cat's-tail moss

4b. Slope aspect SE, S, SW, or W; moisture regime subxeric; undergrowth not dominated by continuous moss cover.
SBSdw2/04 Fd - Pinegrass - Aster

3b. Slope gradient 30% or less.

5a. Black spruce present; prince's pine and Douglas-fir absent or incidental.
SBSdw2/07 PlSb - Feathermoss

5b. Black spruce absent; prince's pine and Douglas-fir usually present.

6a. Moisture regime subxeric or submesic; soil texture sand or loamy sand, or slope aspect SE, S, SW, or W; kinnikinnick present.

7a. Moisture regime subxeric; kinnikinnick abundant (>30% cover) and short-awned ricegrass present.
SBSdw2/03 Pl - Kinnikinnick - Wavy-leaved moss

7b. Moisture regime submesic; kinnikinnick cover <10%; short-awned ricegrass absent or incidental.
SBSdw2/06 Pl - Pinegrass - Feathermoss

6b. Moisture regime mesic or occasionally submesic; soil texture loamy or silty and slope aspect NW, N, NE, or E, or site level; kinnikinnick absent or incidental.
SBSdw2/01 SxwFd - Pinegrass

2b. Moisture regime subhygric to subhydric; sites in moisture-receiving position; water table or evidence of seepage within 1 m of soil surface; mountain alder, soft-leaved sedge, common horsetail, or sweet-scented bedstraw present.

8a. Moisture regime subhygric (rarely hygric); water table usually more than 50 cm below soil surface; sphagnum moss absent and common horsetail cover <10%.

9a. Devil's club and either lady fern, Douglas maple, or foamflower present; black twinberry cover <5%; slope aspect NW, N, NE, or E.
SBSdw2/09 Sxw - Devil's club - Knight's plume

9b. Devil's club, lady fern, Douglas maple, and foamflower absent or incidental; black twinberry cover >5%; slope aspect various.
SBSdw2/08 Sxw - Twinberry

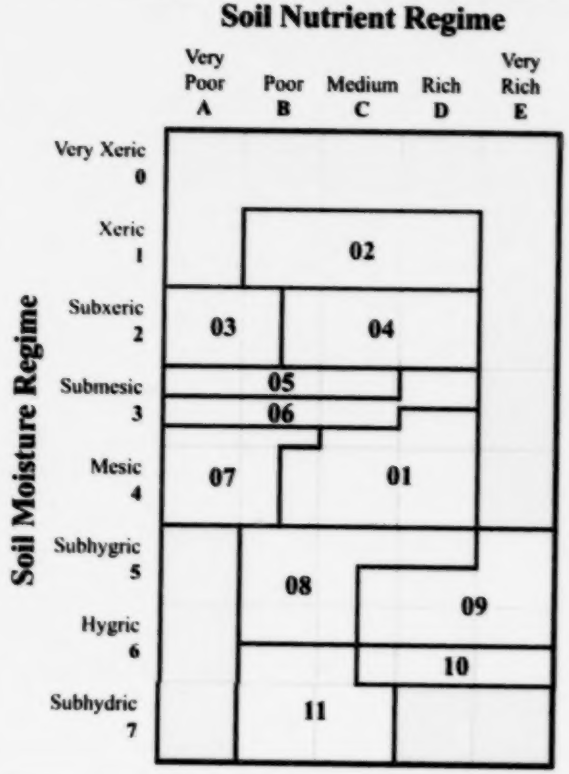
8b. Moisture regime hygric or subhydric; water table often within 50 cm of soil surface in mid summer; sphagnum moss present or common horsetail cover >10%.

10a. Common horsetail abundant (>10% cover); sarsaparilla, baneberry, enchanter's nightshade, and oak fern usually present; black spruce, Labrador tea, dwarf scouring-rush, sphagnum moss, and soft-leaved sedge absent or incidental.
SBSdw2/10 Sxw - Horsetail

10b. Common horsetail not abundant (<10% cover); sarsaparilla, baneberry, enchanter's nightshade, and oak fern usually absent; black spruce, Labrador tea, dwarf scouring rush, sphagnum moss, and soft-leaved sedge usually present.

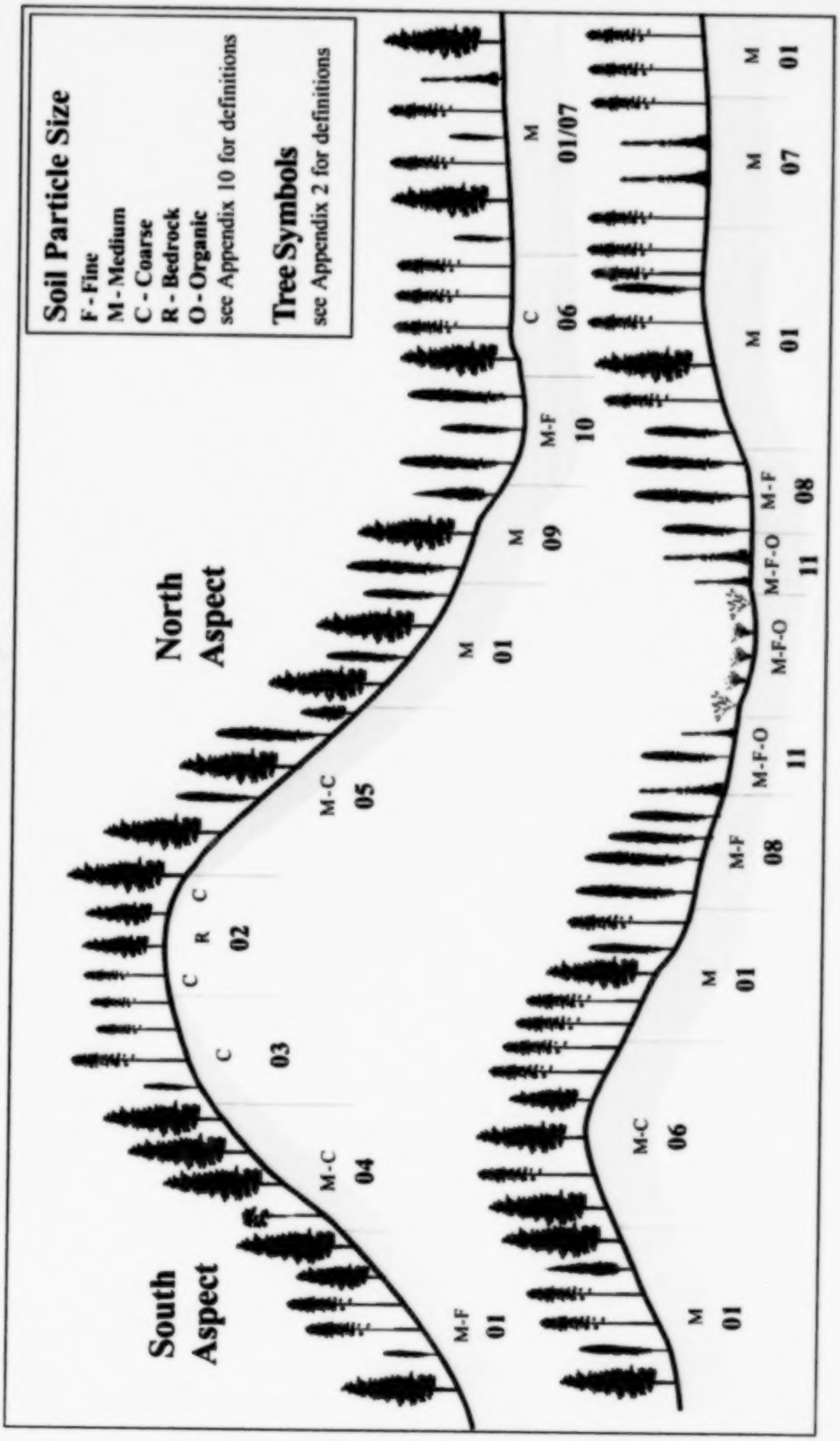
SBSdw2/11 Sb - Soft-leaved sedge - Sphagnum

SBSdw2 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
06
07
01
08
09
10
11

Site Series	
01	SxwFd - Pinegrass
02	FdPl - Cladonia
03	Pl - Kinnikinnick - Wavy-leaved moss
04	Fd - Pinegrass - Aster
05	SxwFd - Cat's-tail moss
06	Pl - Pinegrass - Feathermoss
07	PlSb - Feathermoss
08	Sxw - Twinberry
09	Sxw - Devil's club - Knight's plume
10	Sxw - Horsetail
11	Sb - Soft-leaved sedge - Sphagnum

SBSdw2 Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M-F
01
M-C
04
C
03
C
R
C
02
M-C
05
M
01
M
09
M-F
10
C
06
M
01/07
M
01
M-C
06
M
01
M-F
08
M-F-O
11
M-F-O
M-F-O
11
M-F
08
M
01
M
07
M
01

Site Features of SBSdw2 Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	very dry ridge crests and upper slopes with shallow (< 50 cm) soils over bedrock	gentle to moderately steep SE-, S-, SW-, and W- facing slopes with gravelly sandy soils	steep SE-, S-, SW-, and W-facing slopes on mid and upper slope positions; loamy or sandy soils
Soil Moisture / Nutrient Regimes	submesic, mesic / poor - rich	xeric / poor - rich	subxeric / very poor, poor	subxeric / poor - rich
Slope Position	upper - lower, level	crest, upper	mid, upper	mid, upper
Aspect	all	all	SE, S, SW, W	SE, S, SW, W
Slope Grade (%)	< 30 (rarely to 70)	< 10	< 30	> 30
Soil Texture	gravelly loamy (sandy)	gravelly loamy	gravelly sand, loamy sand	loamy, silty, sandy
Humus Form and Thickness (cm)	Hemimor 3 - 6	Xeromor (Hemimor) 0 - 3	Xeromor, Hemimor 1 - 4	Xeromor, Hemimor 1 - 4
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	uncommon / small / wide	common / small / wide

Site Features of SBSdw2 Site Series (continued)

Site Series	05	06
Key Features	steep NW-, N-, NE-, and E-facing slopes on mid to upper slope position	wide range of submesic sites: low crests, moderate (< 30%) N aspects with sandy soils, moderate S aspects with loamy soils
Soil Moisture / Nutrient Regimes	submesic / very poor - medium	submesic / very poor - rich
Slope Position	mid, upper	mid, upper, level
Aspect	NW, N, NE, E	all but mostly SE, S, SW, W
Slope Grade (%)	> 30	0 - 35
Soil Texture	loamy, silty, sandy	gravelly loamy, sandy
Humus Form and Thickness (cm)	Hemimor 3 - 7	Hemimor 3 - 7
Occurrence / Size / Distribution	common / small / wide	common / moderate / wide

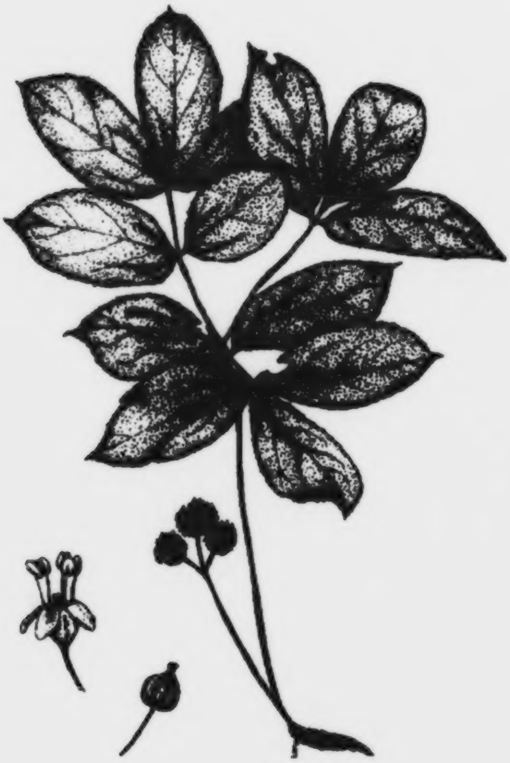
Site Features of SBSdw2 Site Series (continued)

Site Series	09	10	11
Key Features	moist seepage sites on lower slopes; mostly N aspects; not cold air accumulation sites	wet sites at the toe of slopes and in depressions where water table is near (< 50 cm) the surface.	very wet sites at the toe of slopes and in depressions; water table near (< 50 cm) the surface; forested wetlands
Soil Moisture / Nutrient Regimes	subhygric, hygric / medium - very rich	hygric (subhydric) / medium - very rich	hygric, subhydric / poor, medium
Slope Position	lower, toe	toe, level, depression	toe, level, depression
Aspect	NW, N, NE, E	N/A	N/A
Slope Grade (%)	< 30	< 5	< 5
Soil Texture	loamy	loamy, silty	loamy, silty, peaty organic
Humus Form and Thickness (cm)	Hemimor, Hydromoder, Hydromor 7 - 15	Hydromor, Hydromoder, Hemimor 4 - 20	Hydromor, Hydromull, Histomoder Organic soil
Occurrence / Size / Distribution	very uncommon / small / wide	uncommon / small / wide	common / small - moderate / northern areas

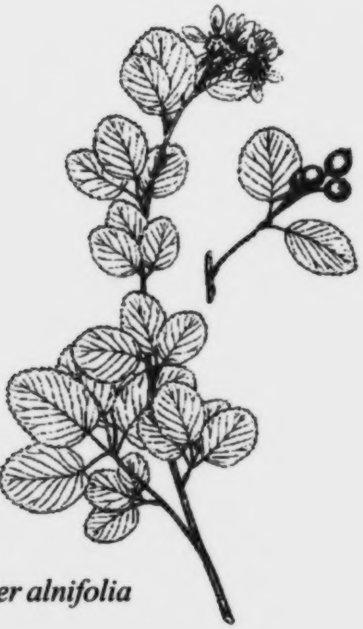
SBSdw2 Vegetation Table[a]

	Site Unit	02	03	04	05	01	07	08	09	10	11	
Tree Layer	*Pinus contorta*		▮▮▮▮▮	▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮				▮▮▮▮	lodgepole pine
	Pseudotsuga menziesii	▮▮▮		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮			▮▮▮			Douglas-fir
	Picea engelmannii x glauca	▮▮▮▮▮			▮▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮		hybrid white spruce
	Betula papyrifera				▮▮▮	▮▮▮						paper birch
	Picea mariana						▮▮▮				▮▮▮▮▮	black spruce
	Abies lasiocarpa								▮▮▮	▮		subalpine fir
Shrub Layer	*Juniperus communis*		▮▮▮	▮▮▮								common juniper
	Shepherdia canadensis	▮▮▮▮▮	▮▮▮	▮▮▮	▮	▮						soopolallie
	Amelanchier alnifolia	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮				saskatoon
	Vaccinium myrtilloides		▮▮▮▮			▮	▮▮▮					velvet-leaved blueberry
	Lonicera involucrata					▮▮		▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	black twinberry
	Alnus tenuifolia							▮▮▮	▮▮▮	▮		mountain alder
	Oplopanax horridus								▮▮▮▮▮	▮		devil's club
	Ledum groenlandicum										▮▮▮	Labrador tea
Herb Layer	*Festuca saximontana*			▮								Rocky Mountain fescue
	Oryzopsis pungens	▮▮▮	▮▮▮									short-awned ricegrass
	Carex richardsonii	▮▮▮	▮▮▮	▮								Richardson's sedge
	Calamagrostis rubescens	▮▮	▮▮▮	▮▮▮▮	▮	▮▮▮▮	▮▮▮					pinegrass
	Arctostaphylos uva-ursi	▮▮▮	▮▮▮▮▮	▮▮▮			▮▮					kinnikinnick
	Lathyrus ochroleucus		▮▮▮	▮▮	▮	▮		▮				creamy peavine
	Linnaea borealis		▮▮▮		▮▮▮	▮▮▮	▮▮	▮▮▮		▮▮	▮▮▮	twinflower
	Solidago spathulata		▮	▮▮▮								spike-like goldenrod
	Aralia nudicaulis				▮▮▮	▮▮▮		▮▮▮	▮▮	▮▮		wild sarsaparilla
	Mitella nuda				▮▮	▮		▮▮▮	▮▮	▮▮▮	▮▮▮	common mitrewort
	Gymnocarpium dryopteris							▮▮▮	▮▮▮	▮▮▮		oak fern
	Rubus pedatus								▮▮▮			five-leaved bramble
	Streptopus amplexifolius							▮	▮▮▮	▮▮▮	▮▮▮	clasping twistedstalk
	Equisetum arvense							▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	common horsetail
	Cinna latifolia									▮▮	▮▮▮	nodding wood-reed
	Circaea alpina							▮		▮▮		enchanter's nightshade
	Carex disperma									▮	▮▮▮▮▮	soft-leaved sedge
Moss Layer	*Polytrichum juniperinum*											juniper haircap moss
	Dicranum polysetum	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮				▮▮▮	wavy-leaved moss
	Cladonia spp.	▮▮▮		▮▮▮						▮		cladonia lichens
	Pleurozium schreberi	▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Hylocomium splendens	▮▮▮			▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮		▮▮▮▮	▮▮▮▮▮	step moss
	Ptilium crista-castrensis				▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	knight's plume
	Rhytidiadelphus triquetrus				▮▮▮▮▮	▮▮▮		▮▮▮▮	▮▮	▮▮▮▮	▮▮▮	electrified cat's-tail moss
	Mnium spp.							▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	leafy mosses
	Sphagnum spp.										▮▮▮▮▮	sphagnum mosses

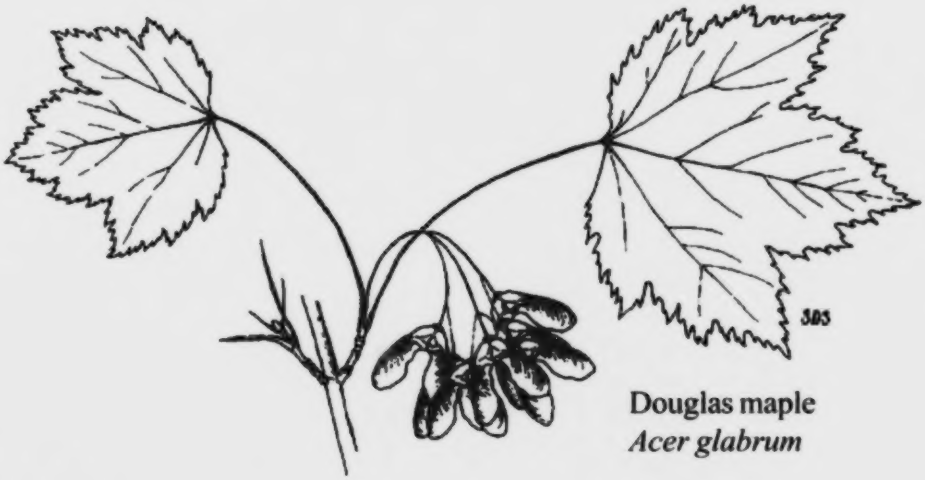
[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Wild sarsaparilla
Aralia nudicaulis



Saskatoon
Amelanchier alnifolia



Douglas maple
Acer glabrum

SBSmc1
SUB-BOREAL SPRUCE
MOIST COLD SUBZONE
MOFFAT VARIANT

The SBSmc1 is a small biogeoclimatic unit (419 km^2 in the Cariboo Forest Region) that occurs on local heights-of-land on the Fraser Plateau, east of the Fraser River. It occurs in the vicinity of Bowers Lake, Little Timothy Mountain, upper Moffat Creek, and Dragon Mountain. Elevations are predominantly 1250–1350 m.

Distinguishing Adjacent Units from the SBSmc1

Lower elevations of the SBSmc1 border the **SBSdw1** on gently rolling and hilly terrain, and the **SBPSmk** on low-relief, level to gently undulating terrain. The **ESSFwk1** occurs at higher elevations in the Quesnel Highland, north of Canim Lake, while the **ESSFdc2** occurs at higher elevations on the edge of the Shuswap Highland, south of Canim Lake. A very small area of **ICHmk3** borders the lower elevation boundary of the SBSmc1, south of Canim Lake.

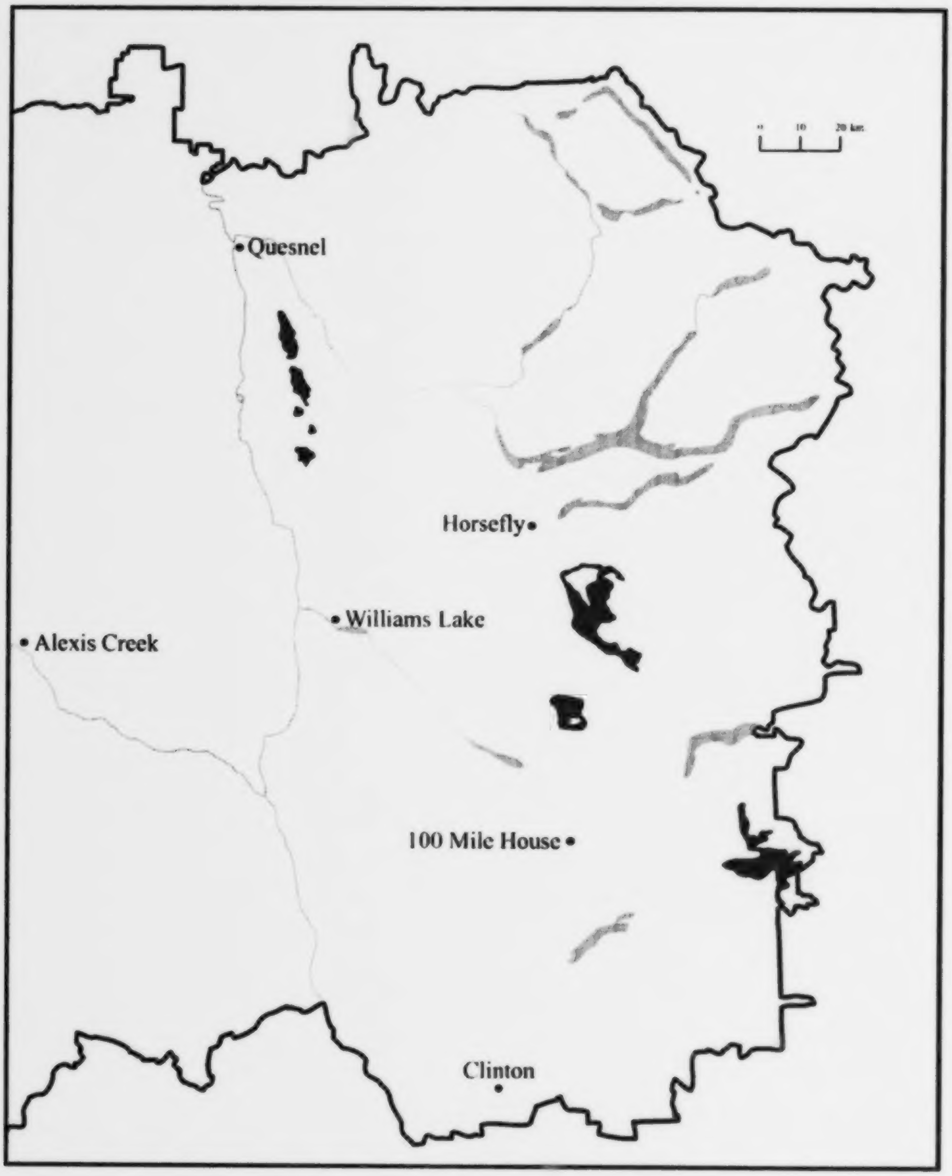
In the **SBSdw1**, zonal sites have:
- wild sarsaparilla and abundant thimbleberry;
- no five-leaved bramble, rosy twistedstalk, or one-leaved foamflower;
- uncommon subalpine fir in forest canopy.

In the **SBPSmk**, zonal sites have:
- abundant pinegrass;
- little or no subalpine fir;
- no five-leaved bramble, queen's cup, rosy twistedstalk, one-leaved foamflower, or bluejoint.

In the **ESSFwk1** and **ESSFdc2**, zonal sites have:
- white-flowered rhododendron, Sitka valerian, Indian hellebore, or red elderberry;
- no pinegrass.

In the **ICHmk3**, zonal sites have:
- western redcedar;
- common wild sarsaparilla, prince's pine, electrified cat's-tail moss, and Douglas-fir.

Distribution of SBSmc1 Variant in the Cariboo Forest Region


0 10 20 km
Quesnel
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton

Site Units of the SBSmc1

Zonal Site Series **01 Sxw - Huckleberry Site Series** dominates the SBSmc1 landscape, occurring on gentle to moderately steep slopes on all slope aspects. The climax forest canopy is dominated by hybrid white spruce and subalpine fir but, due to past fire history, most stands are younger and dominated by lodgepole pine with spruce and subalpine fir regeneration. Douglas-fir is occasionally present in the forest canopy at low elevations. The undergrowth has a sparse to moderate cover of low shrubs, primarily black huckleberry. The moss layer is nearly continuous and only partially obscured by a sparse to moderate cover of low herbaceous plants, primarily bunchberry, queen's cup, and twinflower. Pinegrass is often present but cover values are typically low. Three phases are recognized. The Shallow Phase has 50 cm or less of soil over bedrock, but, due to intermittent seepage water from upslope areas, vegetation is similar to the Typic Phase, which has generally deeper soils. The Sandy Phase occurs primarily on north or east aspects, but occasionally on level sites, with sand or loamy sand soils.

Drier Sites Sites drier than the zonal site series are uncommon in the SBSmc1 landscape and are found primarily on steep south and west aspects and on upper slopes and ridge crests. The vegetation is distinguished by little or no subalpine fir in the forest canopy, the presence of soopolallie or saskatoon in the shrub layer, the presence of pelt lichens in the moss/lichen layer, and the absence of queen's cup and palmate coltsfoot in the herb layer.

02 Pl - Cladonia - Haircap moss Site Series occurs on ridge crests with shallow (<50 cm) soils over bedrock. Bedrock is often exposed. The forest canopy is dominated by lodgepole pine and is usually relatively open. Tree regeneration is sparse to moderate and predominantly subalpine fir. The undergrowth vegetation includes a moderate cover of low shrubs, and several low herbaceous species with small percent covers. Principal shrubs are black huckleberry, birch-leaved spirea, and soopolallie. Pinegrass is the principal herbaceous species but cover is typically less than 5%. The vegetation is distinguished by the relatively small cover of mosses, the presence of cladonia and pelt lichens, and the absence of queen's cup, black twinberry, and Douglas-fir.

03 Fd - Pinegrass - Aster Site Series occurs on steep south- and west-facing slopes and is the only site series in the SBSmc1 that typically has Douglas-fir in the canopy and regeneration layers. The forest canopy is typically relatively open and includes large Douglas-fir and smaller lodgepole pine trees. The undergrowth vegetation has scattered low shrubs, (especially prickly rose, common juniper, and birch-leaved spirea), a moderate cover of herbaceous plants including showy aster and pinegrass, and a relatively small cover of mosses.

Mesic and Near-mesic Sites Not Included in Zonal Site Series

04 Sxw - Huckleberry - Labrador tea Site Series occurs on submesic to subhygric sites in cold air accumulation basins, primarily on level to gently sloping areas removed from the influence of persistent seepage. Soils may be moistened by intermittent seepage. The mature forest canopy is a mixture of lodgepole pine, hybrid white spruce, and subalpine fir. Shrub cover is moderate and predominantly black huckleberry and Labrador tea. Herbaceous species have a sparse cover dominated by twinflower, queen's cup, and rosy twistedstalk. Moss cover is nearly continuous and predominantly red-stemmed feathermoss. The presence of Labrador tea and creeping-snowberry distinguish the vegetation from that on other sites.

Wetter Sites Sites wetter than the zonal site series are common on lower slopes and seepage areas, and at the perimeter of streams and wetlands. The vegetation is generally distinguished from mesic and drier sites by abundant black twinberry and the presence of moist- or wet-site herbaceous species including common mitrewort, trailing raspberry, Sitka valerian, common horsetail, and glow moss.

05 Sxw - Spirea - Glow moss Site Series is relatively uncommon. It occurs on moist sites in cold air accumulation areas, generally on toe slope positions in the bottoms of small valleys. The mature forest canopy is dominated by lodgepole pine or by hybrid white spruce and subalpine fir. A moderate to relatively high percent cover of shrubs and a relatively large number of herbaceous species are usually present. The undergrowth vegetation is distinguished from other moist to wet sites by the presence of pinegrass, scrub birch, and Indian hellebore, and the absence of common horsetail, oak fern, and devil's club.

06 Sxw - Oak fern Site Series is the most common site series on moist lower slopes in the SBSmc1. Seepage water is often present near the soil surface following snowmelt and rainy periods but not continuously throughout the summer. The mature forest canopy is dominated by hybrid white spruce and occasionally by Douglas-fir or lodgepole pine. The undergrowth includes vigorous shrub and herb layers and is distinguished by the presence of palmate-leaved colts-foot, western meadowrue, oak fern, and common mitrewort, and the absence of devil's club, common horsetail, glow moss, and leafy mosses.

07 Sxw - Devil's club - Step moss Site Series is uncommon, occurring on moist lower slopes where seepage water input is more persistent than in the /06 site series. These are moist, rich, and very productive sites. The vegetation of mature forests is distinguished from all other SBSmc1 site series by abundant devil's club. Other species most common in this site series are lady fern and three-leaved foamflower. The mature forest canopy is dominated by hybrid white spruce.

08 Sxw - Horsetail - Glow moss Site Series is a common site series that occurs on wet toe slope positions and wet depressions that have a near-surface (<50 cm) water table throughout the summer. The forest canopy is dominated by hybrid white spruce, typically on raised microsites. Lodgepole pine and subalpine fir are often present in the canopy. The undergrowth vegetation is distinguished by abundant horsetails, either common, wood, or meadow horsetail. Shrubs are moderately abundant; the most common species are black twinberry, black gooseberry, and black huckleberry.

Non-forested Sites Wetlands are common on the floor of small valleys and along gently sloping drainage channels. However, they are generally less abundant than on many other parts of the Fraser Plateau since the SBSmc1 landscape is predominantly well-drained, hilly terrain. Fens dominate the wetland area, although swamps are also present. Grasslands are virtually absent and nearly all of the uplands are forested.

Key To Site Units of the SBSmc1

1a. Moisture regime mesic or drier (rarely subhygric in /04); no evidence of persistent seepage or water table within 1 m of the surface; trailing raspberry, sweet-scented bedstraw, common mitrewort, leafy mosses, and sphagnum moss absent or incidental.

2a. Slope gradient >30% **and** slope aspect SE, S, SW, or W (135–280°).

SBSmc1/03 Fd - Pinegrass - Aster

2b. Slope gentler **or**, if steep, then slope aspect NW, N, NE, or E.

3a. Soils shallow (<50 cm) to bedrock; moisture regime xeric or subxeric (occasionally submesic in /01b).

4a. Cladonia or cladina lichens abundant (total ground cover >5%); red-stemmed feathermoss cover <30% and knight's plume moss absent or incidental (<1% cover); primarily crest slope position.

SBSmc1/02 Pl - Cladonia - Haircap moss

4b. Cladonia and cladina lichens not abundant; red-stemmed feathermoss cover usually >30% and knight's plume present (cover often >10%); mostly upper slope position.

SBSmc1/01 Sxw - Huckleberry;
/01b Shallow Phase

3b. Soils deeper; moisture regime subxeric to mesic (rarely subhygric in /04).

5a. Creeping-snowberry, Labrador tea, and dwarf blueberry present; valley-bottom sites where cold air accumulates; primarily upper Moffat Creek area.

SBSmc1/04 Sxw - Huckleberry - Labrador tea

5b. Creeping snowberry, Labrador tea, and dwarf blueberry absent or incidental; generally on slopes rather than in cold air accumulation sites; widely distributed.

SBSmc1/01 Sxw - Huckleberry;
/01a Typic Phase (not sand soils)
/01c Sand Phase (sand soils)

1b. Moisture regime subhygric or wetter; evidence of persistent seepage water or water table within 1 m of surface; trailing raspberry, sweet-scented bedstraw, common mitrewort, leafy mosses, or sphagnum moss present.

6a. Moisture regime subhygric (rarely hygric in /07)); water table usually not present within 30 cm of surface; baneberry, pinegrass, queen's cup, western meadowrue, devil's club, or bracted lousewort present; Sitka valerian and sphagnum mosses absent.

7a. Devil's club abundant (>10% cover); palmate coltsfoot and trailing raspberry absent or incidental.

SBSmc1/07 Sxw - Devil's club - Step moss

7b. Devil's club not abundant; palmate coltsfoot and trailing raspberry usually present.

8a. Slope position toe (<10% slope gradient) in valley bottom with poor cold air drainage; yarrow, bracted lousewort, Scouler's willow, glow moss, and golden fuzzy fen moss usually present; oak fern absent.

SBSmc1/05 Sxw - Spirea - Glow moss

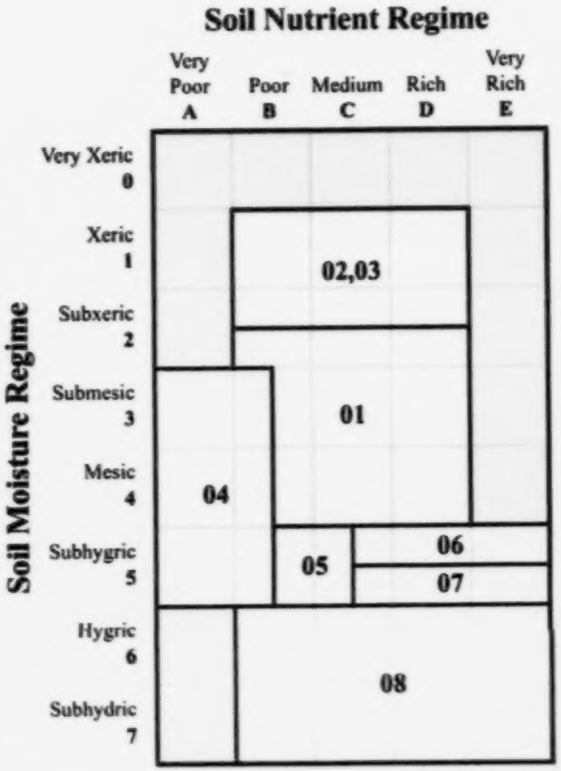
8b. Slope position lower; site usually adjacent to small drainages and, if in valley bottom, then slope gradient generally >10% and cold air drained from site; yarrow, bracted lousewort, Scouler's willow, glow moss, and golden fuzzy fen moss absent; oak fern often present.

SBSmc1/06 Sxw - Oak fern

6b. Moisture regime subhydric or occasionally hygric; water table usually within 30 cm of surface during summer; baneberry, pinegrass, queen's cup, western meadowrue, devil's club, and bracted lousewort absent or incidental; Sitka valerian or sphagnum moss usually present.

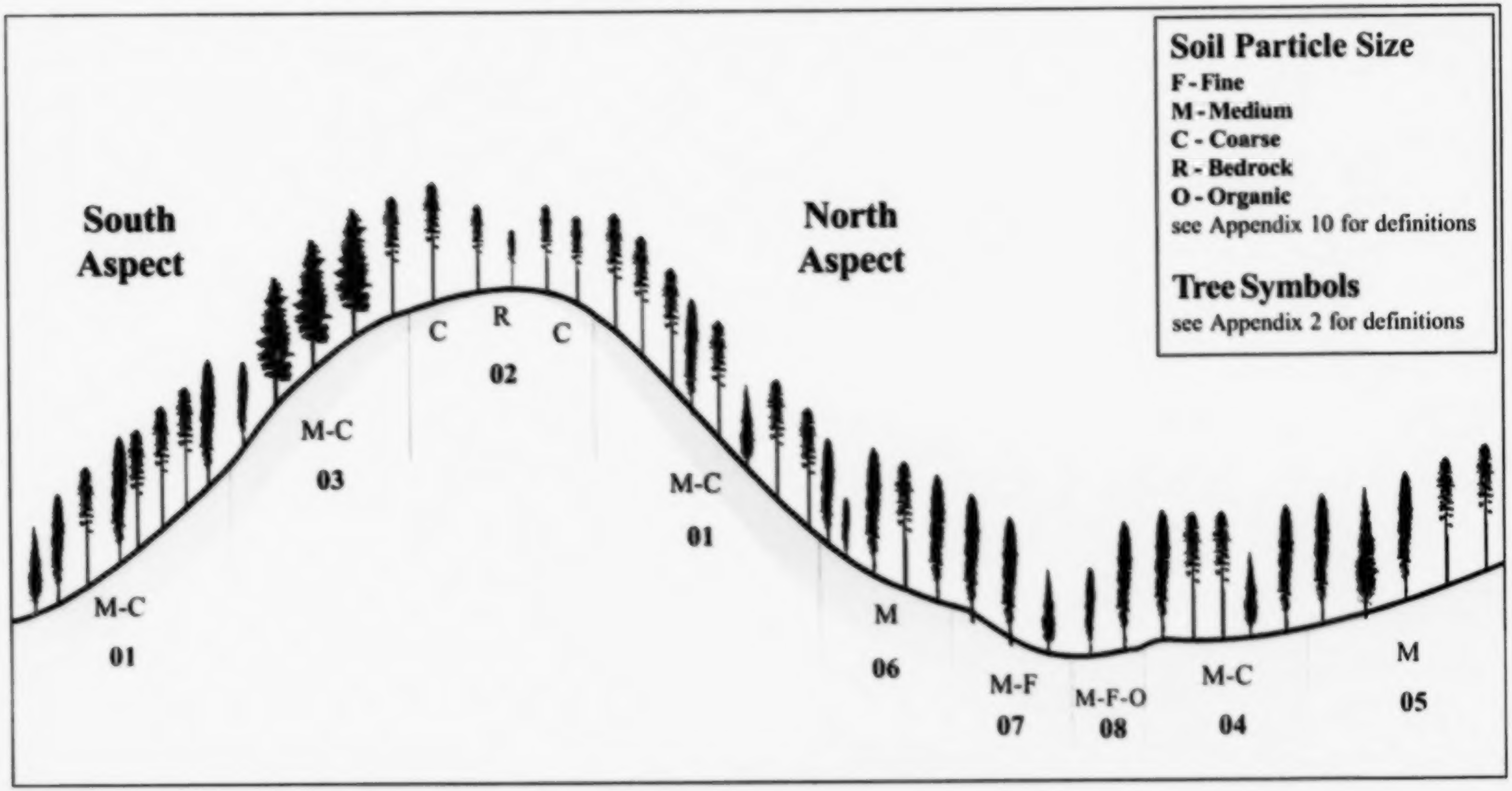
SBSmc1/08 Sxw - Horsetail - Glow moss

SBSmc1 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02,03
01
04
05
06
07
08

Site	Series
01	Sxw - Huckleberry
02	Pl - Cladonia - Haircap moss
03	Fd - Pinegrass - Aster
04	Sxw - Huckleberry - Labrador tea
05	Sxw - Spirea - Glow moss
06	Sxw - Oak fern
07	Sxw - Devil's club - Step moss
08	Sxw - Horsetail - Glow moss

SBSmc1 Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
M-C
01
M-C
03
C
R
C
02
M-C
01
M
06
M-F
07
M-F-O
08
M-C
04
M
05

Site Features of SBSmc1 Site Series

Site Series	01	02	03	04
Key Features	a) zonal and other mesic or near-mesic gently to steeply sloping sites; b) upper slopes with shallow soils and intermittent seepage; c) moderately steep N- and E-facing slopes and some level sites with sandy soils	crest slope positions with shallow soils (< 50 cm) over bedrock	middle and upper slope positions on steep (> 30%) S- and W-facing slopes	mesic, level, or gently sloping (< 10%) sites in cold air accumulation areas; commonly fluvial terraces
Soil Moisture / Nutrient Regimes	subxeric - mesic / poor - rich	xeric, subxeric / poor - rich	xeric, subxeric / poor - rich	submesic - subhygric / very poor, poor
Slope Position	upper - lower, level	crest, upper	upper, mid	mid, level
Aspect	all, but, if steep, then primarily N or E	all	SE, S, SW, W	all
Slope Grade (%)	0 - 70	< 10 (crest) 30 - 70 (upper)	> 30	< 10
Soil Texture	gravelly loamy, sand	gravelly loamy, sand	gravelly loamy	gravelly sandy and loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 13	Xeromor 1 - 2	Xeromor, Hemimor 1 - 5	Hemimor, Mormoder 3 - 16
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	uncommon / small / wide	uncommon / small / primarily upper Moffat Creek drainage

Site Features of SBSmc1 Site Series (continued)

Site Series	05	06	07	08
Key Features	moist, level to gentle slopes in valley bottoms with poor cold air drainage; moist, cold sites	moist lower slope positions with intermittent near-surface seepage water; not cold air ponding sites	very moist lower slope positions with persistent near-surface seepage input; primarily N or E aspects	wet toe slope sites and depressions with near-surface (< 30 cm) water table; wet, cold sites
Soil Moisture / Nutrient Regimes	subhygric / poor, medium	subhygric / medium - very rich	subhygric, (hygric) / rich, very rich (medium)	hygric, subhydric / poor - very rich
Slope Position	toe, lower	lower, toe (mid)	lower, mid, toe	toe, depression
Aspect	all	all	all, but mostly N or E	all
Slope Grade (%)	< 10	0 - 30	0 - 20	0 - 10
Soil Texture	loamy	gravelly loamy	loamy	loamy, silty, clayey, organic
Humus Form and Thickness (cm)	Hemimor, Mormoder 5 - 15	Mormoder 6 - 50	Mormoder 5 - 30	Hydromor, Hydromoder 5 - 50
Occurrence / Size / Distribution	uncommon / small / Mt. Timothy area	common / medium / wide	very uncommon / small / wide	common / small / wide

SBSmc1 Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	
Tree Layer	*Pseudotsuga menziesii*		▮▮▮▮					▮▮▮		Douglas-fir
	Pinus contorta	▮▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮		▮▮▮▮	lodgepole pine
	Picea engelmannii x *glauca*			▮▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	hybrid white spruce
	Abies lasiocarpa				▮▮▮	▮▮	▮▮▮▮	▮▮▮	▮	subalpine fir
Shrub Layer	*Shepherdia canadensis*	▮▮▮	▮							soopolallie
	Amelanchier alnifolia	▮▮	▮							saskatoon
	Rosa acicularis	▮▮▮	▮▮▮			▮▮▮				prickly rose
	Spiraea betulifolia	▮▮▮	▮		▮▮▮	▮▮▮	▮			birch-leaved spirea
	Vaccinium membranaceum	▮▮▮▮	▮	▮▮▮	▮▮▮	▮▮▮	▮▮		▮▮▮	black huckleberry
	Ledum groenlandicum			▮▮▮						Labrador tea
	Lonicera involucrata			▮▮▮	▮	▮▮▮	▮▮▮	▮▮	▮▮▮	black twinberry
	Ribes lacustre			▮	▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	black gooseberry
	Oplopanax horridus							▮▮▮▮▮		devil's club
Herb Layer	*Trisetum spicatum*	▮▮	▮							spike trisetum
	Hieracium albiflorum	▮▮		▮						white-flowered hawkweed
	Calamagrostis rubescens	▮▮▮	▮▮▮▮▮		▮▮▮	▮▮▮▮				pinegrass
	Vaccinium caespitosum	▮▮	▮	▮▮		▮▮▮				dwarf blueberry
	Clintonia uniflora			▮▮▮	▮▮▮	▮▮	▮▮			queen's cup
	Gaultheria hispidula			▮▮▮						creeping-snowberry
	Petasites frigidus var *palmatus*			▮▮		▮▮▮	▮▮		▮▮	palmate coltsfoot
	Actaea rubra					▮▮	▮▮▮			baneberry
	Thalictrum occidentale					▮▮▮	▮▮			western meadowrue
	Galium triflorum					▮▮	▮▮	▮▮	▮▮	sweet-scented bedstraw
	Rubus pubescens					▮▮▮	▮▮▮		▮▮▮	trailing raspberry
	Mitella nuda					▮▮▮	▮▮		▮▮	common mitrewort
	Cinna latifolia							▮▮	▮▮	nodding wood-reed
	Valeriana sitchensis							▮▮	▮▮▮	Sitka valerian
	Gymnocarpium dryopteris						▮		▮▮▮	oak fern
	Equisetum spp.					▮▮▮			▮▮▮▮▮	horsetails
Moss Layer	*Cladina* spp.	▮▮▮								reindeer lichens
	Peltigera spp.	▮▮▮▮	▮▮▮							pelt lichens
	Cladonia spp.	▮▮▮		▮						cladonia lichens
	Pleurozium schreberi	▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	red-stemmed feathermoss
	Ptilium crista-castrensis		▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮	knight's plume
	Rhytidiadelphus triquetrus					▮▮▮	▮	▮▮▮		electrified cat's-tail moss
	Hylocomium splendens						▮▮▮▮	▮▮▮▮▮	▮	step moss
	Aulacomnium palustre					▮▮▮▮			▮	glow moss
	Sphagnum spp.								▮▮▮▮	sphagnums
	Mnium spp.								▮▮▮▮▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBSmc2
SUB-BOREAL SPRUCE
MOIST COLD SUBZONE
BABINE VARIANT

The SBSmc2 is a relatively large biogeoclimatic unit that occurs primarily in the Prince Rupert and Prince George forest regions. In the Cariboo Forest Region (1205 km^2), it occurs on local heights-of-land west of the Fraser River in the north-central portion of the Fraser Plateau. It is primarily above the SBPS Zone at elevations of 1200–1500 m.

Distinguishing Adjacent Units from the SBSmc2 (Cariboo Forest Region only)

The **MSxv** replaces the SBSmc2 at similar elevations where the climate is drier, primarily where the rainshadow effect of the Itcha and Ilgachuz mountains is more pronounced than in the SBSmc2. The **ESSFmv1** occurs very locally at elevations above the SBSmc2. Low elevations of the SBSmc2 are bordered primarily by the **SBPSmk** east of the Nazko River, and by the **SBPSdc** west of the Nazko River. The **SBSdw2** occurs below the SBSmc2 at its eastern extent, near the Fraser River valley.

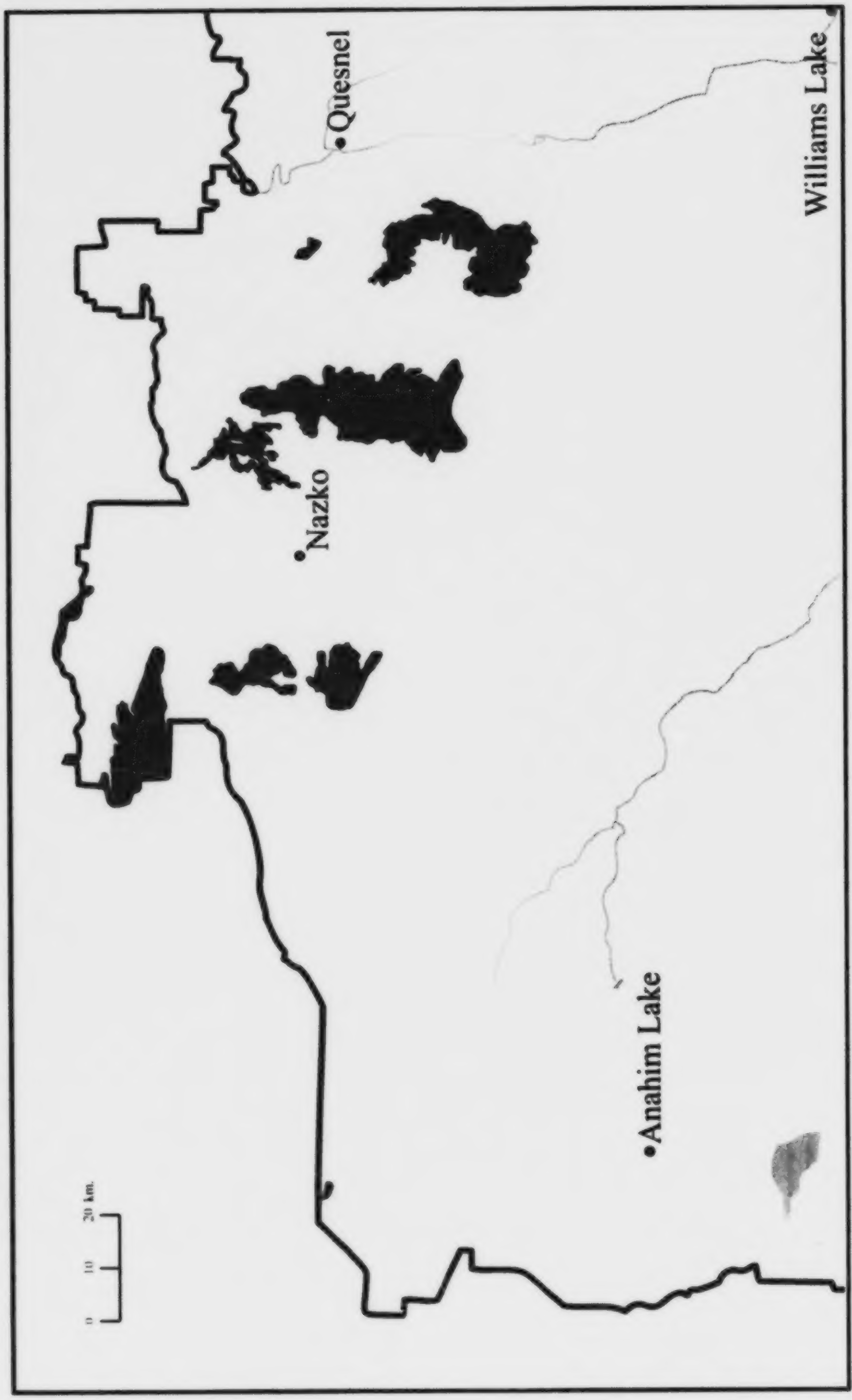
In the **MSxv**, zonal sites have:
- crowberry and grouseberry;
- no five-leaved bramble, rosy twistedstalk, queen's cup, one-leaved foamflower, or bluejoint.

In the **SBPSmk**, zonal sites have:
- abundant pinegrass;
- little or no subalpine fir;
- no five-leaved bramble, queen's cup, rosy twistedstalk, one-leaved foamflower, or bluejoint.

In the **ESSFmv1**, zonal sites have:
- white-flowered rhododendron, Sitka valerian, or Indian hellebore.

In the **SBSdw2**, zonal sites have:
- Douglas-fir, prince's pine, wild sarsaparilla, and saskatoon;
- abundant pinegrass;
- moss layer generally obscured by herbaceous layer.

Distribution of SBSmc2 Variant in the Cariboo Forest Region


Quesnel
Williams Lake
Nazko
Anahim Lake
0
10
20 km.

Site Units of the SBSmc2

Zonal Site Series **01 Sxw - Huckleberry Site Series** dominates the SBSmc2 landscape, occurring on gentle to moderately steep slopes on all slope aspects and from lower to crest slope positions. Soils are primarily loamy and occasionally sandy. The climax forest canopy is dominated by hybrid white spruce and subalpine fir but, due to past fire history, most stands are younger and dominated by lodgepole pine with spruce and subalpine fir regeneration. The undergrowth has a sparse to moderate cover of shrubs, primarily black huckleberry and Sitka alder. The moss layer is nearly continuous and only partially obscured by a sparse to moderate cover of low herbaceous plants, primarily bunchberry, queen's cup, and twinflower. Pinegrass is often present but percent cover values are typically very small. Two phases are recognized in the Cariboo Forest Region. The Shallow Phase (/01b) occurs on shallow (25–50 cm) soils over bedrock, usually on upper slope positions where soils are moistened by intermittent seepage. The Typic Phase (/01a) occurs on deeper soils.

Drier Sites Sites drier than the /01 site series are primarily those with coarse (usually glaciofluvial) soils and those on crest slope positions with shallow soils over bedrock. Steep south aspects and pronounced crest slope positions with deep soils are also included but are not common in the Cariboo Forest Region SBSmc2. All of these sites are included in one site series with two phases.

02 Pl - Huckleberry - Cladonia Site Series includes all sites drier than those of the /01 site series. The Typic Phase (/02a) includes sites with shallow soils on upper and crest slope positions, steep south aspects on mid to upper slope positions, and dry crests with deeper soils. The Sand Phase (/02b) includes all subxeric and drier sites with coarse sandy soils. The vegetation is distinguished by the presence of common juniper and abundant lichens as well as by the absence or incidental occurrence of black twinberry, knight's plume, and five-leaved bramble. The mature forest canopy is typically dominated by lodgepole pine. Shrubs have a moderate cover consisting primarily of black huckleberry, common juniper, birch-leaved spirea, and soopolallie. Herbaceous plants are relatively sparse. The moss/lichen layer is dominated by lichens, especially cladonia and cladina lichens. Red-stemmed feathermoss has a low to moderate, patchy cover on most sites.

Mesic and Near-mesic Sites Not Included in Zonal Site Series

03 SbPl - Feathermoss Site Series occurs in the Prince Rupert and Prince George forest regions but has not been noted in the Cariboo Forest Region. It occurs primarily on mid to lower slope positions on north aspects where cold air collects. The forest canopy is typically dominated by lodgepole pine but includes a significant component of black spruce. The undergrowth vegetation has a moderate cover of low shrubs, including Labrador tea and black huckleberry, and a moderate to high cover of low herbs, especially dwarf blueberry, bunchberry, and creeping-snowberry. Feathermosses are abundant. The vegetation is distinguished by the presence of black spruce and absence of moist- to wet-site shrubs such as black twinberry, mountain alder, and scrub birch.

Wetter Sites Sites wetter than those of the zonal site series are moderately common, occurring primarily on lower slopes and on riparian areas adjacent to streams and wetlands. The vegetation is distinguished by the presence of common mitrewort, palmate coltsfoot, oak fern, lady fern, or horsetails.

04 Sxw - Huckleberry - Dwarf blueberry Site Series is moderately common in the Cariboo Forest Region on mid to lower slope positions. Intermittent seepage volumes and duration are low and, as a result, are often not evidenced by soil mottles. This unit occurs primarily in areas of low to moderate relief where cold air drainage is poor. The mature forest canopy is dominated by hybrid white spruce or lodgepole pine with a significant component of subalpine fir. Tree regeneration is moderately dense and primarily subalpine fir and spruce. The undergrowth is dominated by a nearly continuous moss layer with scattered low herbs and low shrubs. Principal shrubs are black huckleberry (<50 cm tall) along with scattered black twinberry and Sitka alder. The undergrowth is distinguished by the presence of dwarf blueberry, trailing raspberry, common mitrewort, and palmate coltsfoot, and the absence or only incidental occurrence of oak fern, bluejoint, leafy mosses, and horsetails.

05 Sxw - Twinberry - Coltsfoot Site Series is common in the Prince Rupert Forest Region but has not been observed in the Cariboo Forest Region. It occurs on moist mid and lower slope positions, often on warm aspects. The undergrowth vegetation is distinguished by abundant thimbleberry and black twinberry but no oak fern or devil's club.

06 Sxw - Oak fern Site Series is present in the Cariboo Forest Region but is not common. It occurs on moist mid and lower slope positions, especially on north-facing slopes. Topographic relief is typically greater than in the /04 unit and sufficient to provide rapid drainage of cold air. The canopy of mature forests is dominated by lodgepole pine or hybrid white spruce, and the tree regeneration layers by spruce and subalpine fir. This site series is distinguished by abundant oak fern and little or no horsetail. The shrub layer is characterized by a sparse to moderate cover of black twinberry and a small number of other moist-site species. Bunchberry, bluejoint, and trailing raspberry are typical species of the herbaceous layer. Feathermosses dominate the nearly continuous moss cover.

07 Sxw - Scrub birch - Feathermoss Site Series has not been observed in the Cariboo Forest Region but may be present at the perimeter of wetlands in cold air accumulation basins. It is uncommon in the Prince Rupert Forest Region at the border of fens and bogs. These are moist sites with a fluctuating water table, cold soils, and frequent summer frost. The canopy of mature forests is dominated by lodgepole pine, hybrid white spruce, and subalpine fir. The undergrowth vegetation is distinguished by relatively abundant scrub birch, willows, black twinberry, and glow moss.

08 Sxw - Twinberry - Oak fern Site Series occurs in the Cariboo Forest Region on moist to wet slopes and depressions in cold air accumulation areas. In contrast to the /07 unit, it typically does not occur at the border of non-forested wetlands but rather on lower and toe slopes in a forested matrix, especially adjacent to streams. These sites are generally colder and wetter than those of the /05 Site Series. The forest canopy is dominated by relatively widely spaced, large hybrid white spruce and subalpine fir. The shrub layer is vigorous and diverse. The vegetation is distinguished by abundant black twinberry and oak fern.

09 Sxw - Devil's club Site Series has not been observed and is not expected to occur in the Cariboo Forest Region. It is found primarily in the mountainous western part of the SBSmc2 in the Prince Rupert Forest Region. It is distinguished by abundant devil's club.

10 Sxw - Horsetail Site Series has not been observed in the Cariboo Forest Region but is very similar to the /11 Site Series. It is relatively common in the Prince Rupert Forest Region and differs from the /11 Site Series by greater cover of mountain alder and highbush-cranberry.

11 Sxw - Horsetail - Glow moss Site Series occurs in the Cariboo Forest Region on wet toe slope positions and depressions where a water table or persistent seepage is present within 50 cm of the soil surface. The forest canopy is dominated by hybrid white spruce, subalpine fir, or lodgepole pine. Black spruce is occasionally present. Trees are typically large and widely spaced and tree regeneration is typically sparse. The undergrowth vegetation is distinguished by abundant horsetail, less mountain alder than in /10, little or no devil's club, and less black twinberry and oak fern than in /08.

12 SbSxw - Scrub birch - Sedge Site Series is a forested wetland that occurs in the Prince Rupert Forest Region but has not been observed in the Cariboo Forest Region. It is characterized by clumps of poorly growing black spruce and white spruce, interspersed with a variety of wet-site shrubs.

Non-forested Sites Wetlands are common on the floor of small valleys and along gently sloping drainage channels, but are generally less abundant than on other parts of the Fraser Plateau due to the predominance of well-drained, hilly terrain. Sedge fens and shrub fens dominate the wetlands, although swamps are also present. Grasslands are virtually absent and nearly all of the upland terrain is forested.

Key to Site Units of the SBSmc2 (Cariboo Forest Region only)

Note: SBSmc2/03, /05, /07, /09, /10, and /12 have not been observed in the Cariboo Forest Region and are not included in this key.

1a. Moisture regime mesic or drier; no evidence of persistent seepage water or water table within 1 m of soil surface; trailing raspberry, palmate coltsfoot, common mitrewort, sweet-cicely, and stepmoss absent or incidental.

2a. Moisture regime subxeric or drier; cladonia and cladina lichens abundant (>5% cover); common juniper present.

SBSmc2/02 Pl - Huckleberry - Cladonia;

/02a **Typic Phase** (very shallow soils or steep S or SW aspect on upper slope position or dry crests with deep soils);

/02b **Sand Phase** (sand or loamy sand soils)

2b. Moisture regime submesic or mesic; cladonia and cladina lichens absent or with small (<5%) cover; common juniper absent.

SBSmc2/01 Sxw - Huckleberry;

/01a **Typic Phase** (soils >50 cm to bedrock);

/01b **Shallow Phase** (soils <50 cm to bedrock)

1b. Moisture regime mesic to subhydric; evidence of intermittent or persistent seepage or water table within 1 m of surface; trailing raspberry, palmate coltsfoot, common mitrewort, sweet-cicely, or stepmoss present.

3a. Moisture regime subhygric (occasionally mesic); horsetail species not abundant (<1% cover), and soft-leaved sedge absent; persistent seepage or water table not present within 50 cm of surface (seepage often present early in growing season and following heavy rains).

4a. Oak fern cover >15%; leafy mosses, one-leaved foamflower, or bluejoint present; pinegrass and dwarf blueberry absent or incidental; cold air usually rapidly drained from site.

SBSmc2/06 Sxw - Oak fern

4b. Oak fern, leafy mosses, one-leaved foamflower, and bluejoint absent or incidental; pinegrass or dwarf blueberry usually present; cold air drainage usually poor.

SBSmc2/04 Sxw - Huckleberry - Dwarf blueberry

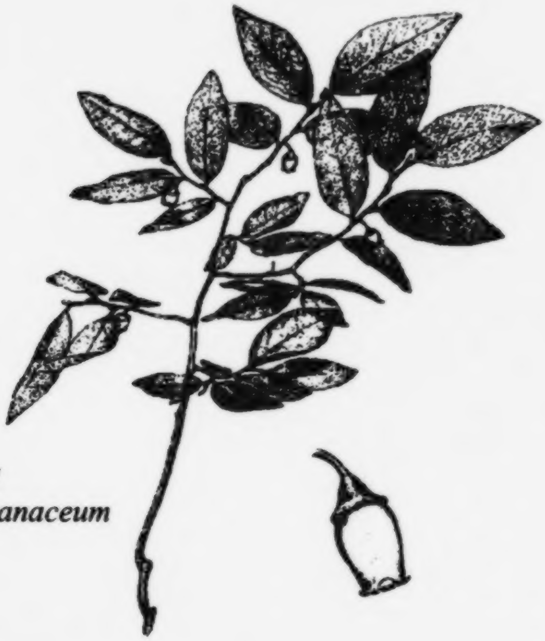
3b. Moisture regime hygric or subhydric (occasionally subhygric); horsetail species abundant (>10% cover); soft-leaved sedge present; persistent seepage water or water table within 50 cm of soil surface.

5a. Black twinberry abundant (usually >15% cover) and horsetail species cover <20%; slope position generally toe; persistent seepage often within 50 cm of surface; soils often mottled but not strongly gleyed (dull colours).

SBSmc2/08 Sxw - Twinberry - Oak fern

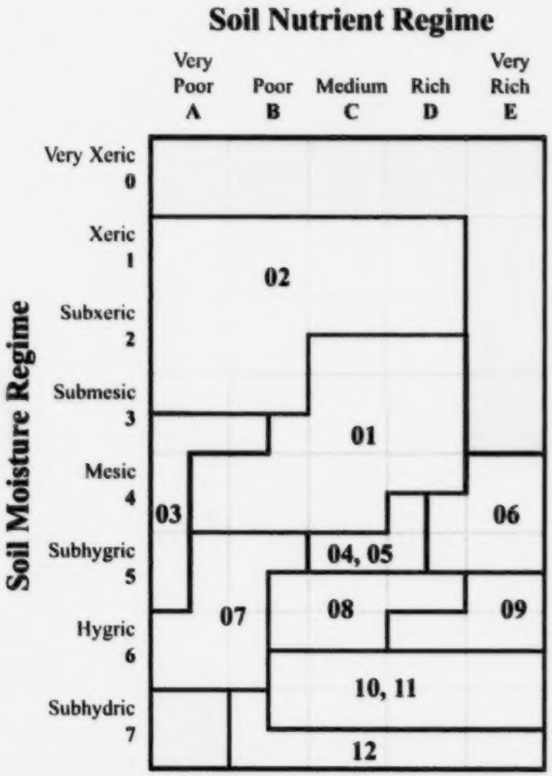
5b. Black twinberry not abundant (<5% cover), and horsetail species cover >20%; slope position usually depression or flats with near-surface (<50 cm) water table; soils usually strongly gleyed (dull colours) and mottled.

SBSmc2/11 Sxw - Horsetail - Glow moss



Black huckleberry
Vaccinium membranaceum

SBSmc2 Edatopic Grid

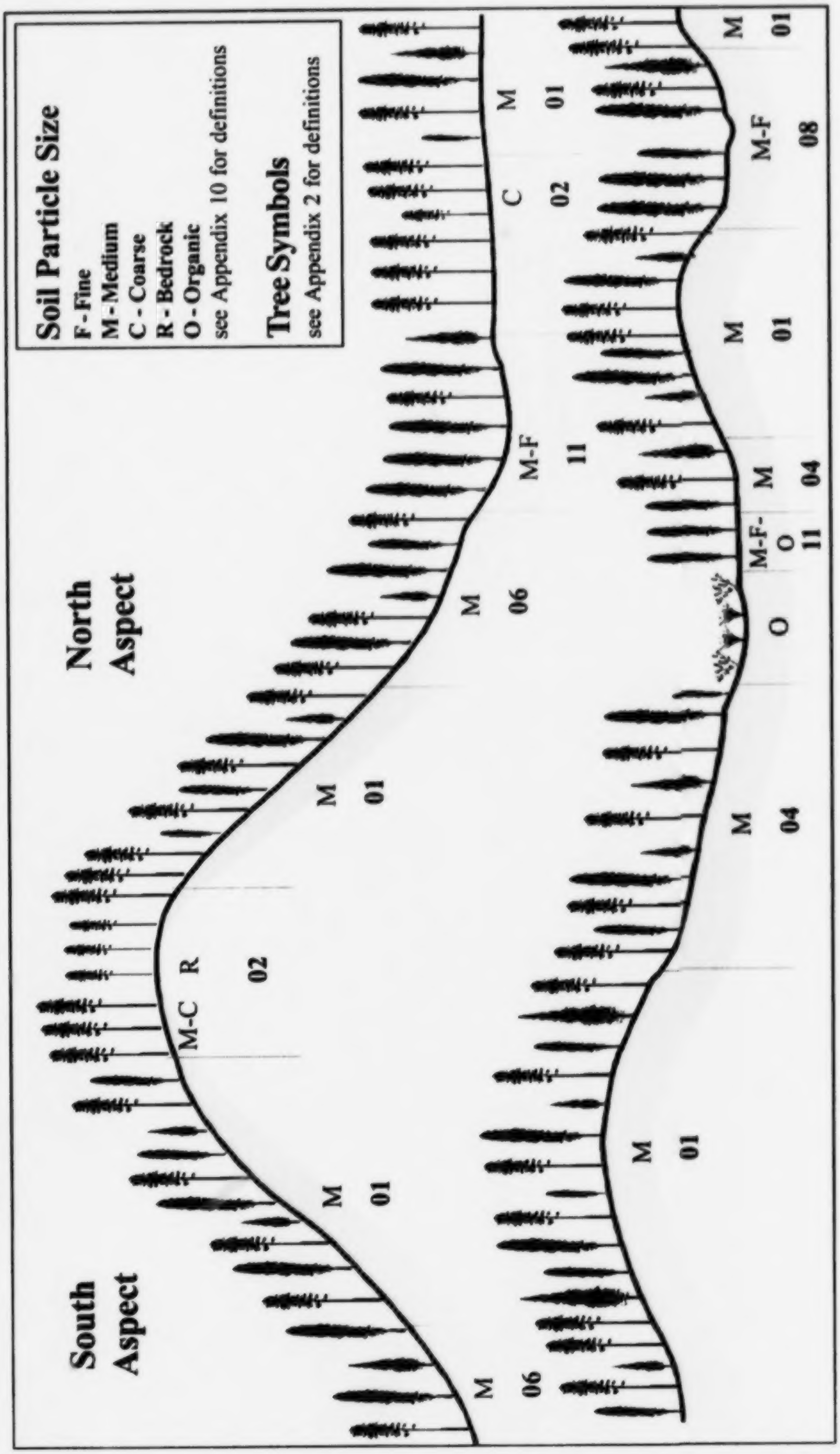

Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
01
03
06
04, 05
07
08
09
10, 11
12

Site Series

01	Sxw - Huckleberry
02	Pl - Huckleberry - Cladonia
04	Sxw - Huckleberry - Dwarf blueberry
06	Sxw - Oak fern
08	Sxw - Twinberry - Oak fern
11	Sxw - Horsetail - Glow moss

Note: Site Series 03, 05, 07, 09, 10, and 12 occur in the Prince George Forest Region or Prince Rupert Forest Region but have not been noted in the Cariboo Forest Region.

SBSmc2 Landscape Profile (Cariboo Forest Region Units Only)


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M
06
M
01
M-C
R
02
M
01
M
06
M-F
11
C
02
M
01
M
01
M
04
O
M-F-
O
11
M
04
M
01
M-F
08
M
01

Site Features of SBSmc2 Site Series (Cariboo Forest Region only)

Site Series	01	02	04
Key Features	/01a: zonal and other mesic or submesic gently to steeply sloping sites with deep soils; /01b: submesic and mesic upper slopes with shallow (< 50 cm) soils	/02a: crest slope positions with shallow (< 50 cm) soils over bedrock and upper slope position on steep S- or SW-facing slopes; /02b: very dry sites with coarse sandy soils	mesic to moist, mid and lower slope positions; seepage water may be present early in season and following heavy rains; soils often not mottled; cold air drainage limited by low-relief topography
Soil Moisture / Nutrient Regimes	(subxeric) submesic, mesic / very poor - rich	xeric - submesic / very poor - rich	mesic, subhygric / medium, rich
Slope Position	upper, mid, level, and low broad crests	/02a: crest, upper; /02b: level (upper - toe)	mid, lower, level
Aspect	all	all	all
Slope Grade (%)	0 - 30	a) 0 - 60 b) < 5 (0 - 30)	0 - 30
Soil Texture	loamy	a) gravelly loamy b) gravelly sandy	loamy
Humus Form and Thickness (cm)	Hemimor 3 - 8	Xeromor 2 - 3	Hemimor, Humimor, Mormoder 4 - 10
Occurrence / Size / Distribution	predominant / large / wide	common / small - moderate / wide	common / moderate / wide

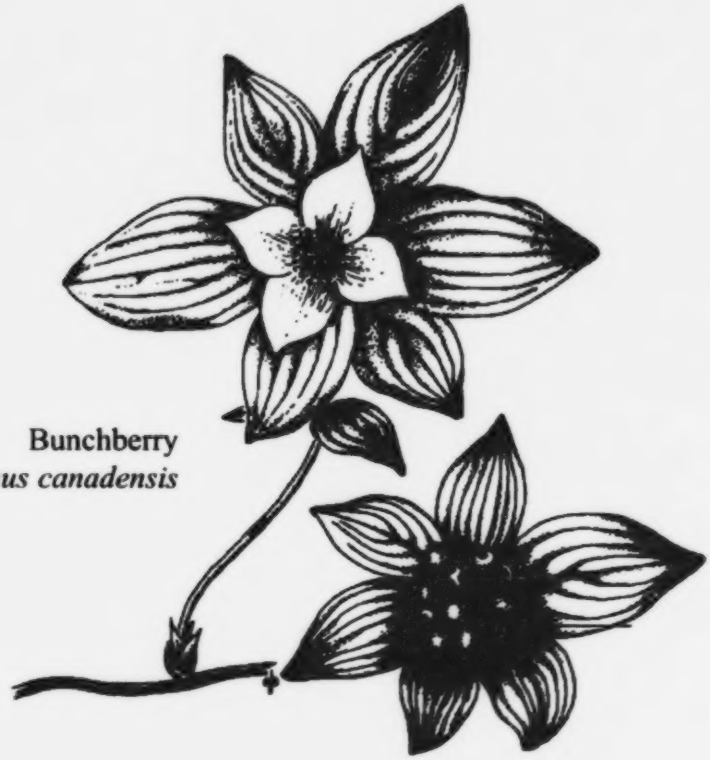
Site Features of SBSmc2 Site Series (Cariboo Forest Region only) (continued)

Site Series	06	08	11
Key Features	moist, mid to lower slope positions with intermittent seepage; generally occurs on terrain with more effective cold air drainage than /04	moist to wet, lower and toe slope positions with persistent seepage within 50 cm of soil surface; usually in cold air accumulation areas	wet toe slope positions, depressions and flats with persistent seepage or water table within 50 cm of surface; generally wetter than /08 unit
Soil Moisture / Nutrient Regimes	mesic, subhygric / rich, very rich	subhygric, hygric / poor - rich	hygric, subhydric / poor - very rich
Slope Position	mid, lower	lower, toe (depression)	depression, level, toe
Aspect	all, but primarily NW, N, NE, or E	all	N/A
Slope Grade (%)	0 - 30	0 - 10	0 - 5
Soil Texture	loamy	loamy, silty	silty, loamy, organic
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 8	Mormoder, Hydromoder 10 - 25	Hydromoder, Hydromull 10 - 40
Occurrence / Size / Distribution	uncommon / moderate / wide	common / moderate / wide	common / small / wide

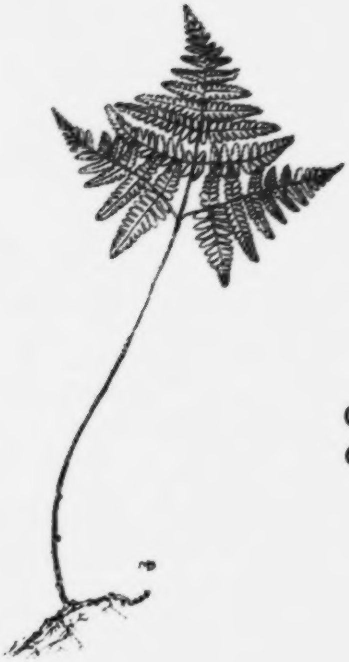
SBSmc2 Vegetation Table[a]

	Site Unit	02	01	04	06	08	11	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮		▮▮▮	lodgepole pine
	Abies lasiocarpa		▮	▮		▮▮▮	▮▮▮	subalpine fir
	Picea engelmannii x glauca		▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	hybrid white spruce
Shrub Layer	*Juniperus communis*	▮▮▮						common juniper
	Spiraea betulifolia	▮▮▮	▮▮▮	▮▮▮	▮			birch-leaved spirea
	Alnus crispa		▮▮▮▮	▮▮▮	▮			green alder
	Vaccinium membranaceum	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮		▮▮▮	black huckleberry
	Rosa acicularis	▮▮	▮	▮▮	▮	▮▮	▮	prickly rose
	Rubus idaeus				▮▮	▮▮		red raspberry
	Lonicera involucrata		▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	black twinberry
	Ribes lacustre			▮	▮▮▮	▮▮	▮▮▮	black gooseberry
Herb Layer	*Vaccinium caespitosum*	▮▮		▮▮▮				dwarf blueberry
	Linnaea borealis	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮	twinflower
	Arnica cordifolia	▮▮▮	▮▮▮	▮▮	▮▮▮	▮▮	▮	heart-leaved arnica
	Abies lasiocarpa	▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮	▮	subalpine fir
	Cornus canadensis	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	bunchberry
	Orthilia secunda		▮▮	▮▮	▮		▮	one-sided wintergreen
	Rubus pedatus		▮▮▮	▮▮▮	▮▮▮▮	▮▮	▮	five-leaved bramble
	Listera cordata			▮▮	▮▮		▮▮	heart-leaved twayblade
	Mitella nuda			▮▮	▮	▮▮	▮▮▮	common mitrewort
	Petasites palmatus			▮▮▮	▮▮	▮▮	▮▮	palmate coltsfoot
	Rubus pubescens			▮▮	▮	▮▮▮	▮▮▮	trailing raspberry
	Streptopus amplexifolius			▮	▮	▮▮	▮▮▮	clasping twistedstalk
	Calamagrostis canadensis				▮▮▮▮	▮▮▮	▮▮▮	bluejoint
	Tiarella trifoliata var *unifoliata*				▮▮▮		▮	one-leaved foamflower
	Tiarella trifoliata var *trifoliata*					▮▮		three-leaved foamflower
	Gymnocarpium dryopteris				▮▮▮▮▮	▮▮▮▮	▮	oak fern
	Athyrium filix-femina				▮		▮▮▮	lady fern
	Equisetum spp.				▮▮	▮▮▮▮	▮▮▮▮▮	horsetails
	Carex disperma					▮▮	▮▮▮	soft-leaved sedge
Moss Layer	*Cladina* spp.	▮▮▮▮▮	▮▮					reindeer lichens
	Cladonia spp.	▮▮▮▮	▮▮					cladonia lichens
	Polytrichum spp.	▮▮▮	▮					haircap mosses
	Cetraria islandica	▮▮						Icelandmoss lichen
	Dicranum polysetum	▮▮▮▮	▮			▮▮		wavy-leaved moss
	Peltigera spp.	▮▮▮					▮	pelt lichens
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Hylocomium splendens			▮▮▮▮▮		▮▮▮▮	▮	step moss
	Ptilium crista-castrensis		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	knight's plume
	Mnium spp.				▮	▮▮▮▮	▮▮▮▮	leafy mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Bunchberry
Cornus canadensis



Oak fern
Gymnocarpium dryopteris

SBSmh

SUB-BOREAL SPRUCE MOIST HOT SUBZONE

The SBSmh is a small subzone (789 km^2) in the Cariboo Forest Region that occurs on lower valley slopes and valley bottoms of the Fraser River valley, north of about Alexandria, and in the Quesnel River valley west of Quesnel Forks. The SBSmh also extends northward along the Fraser River to about Prince George. Elevations are from valley bottom (about 450 m) to 750 m.

Distinguishing Adjacent Units from the SBSmh

The **SBSmw** occurs above the SBSmh east of the Quesnel River valley and along the east side of the Fraser River valley north of the Cottonwood River. It has a cooler, slightly wetter climate. The **SBSdw1** and **SBSdw2** occur above the SBSmh along most of the Fraser River valley as well as west of the Quesnel River valley. The **IDFxm** replaces the SBSmh in the Fraser River valley south of about Alexandria. Near Quesnel Forks, the **ICHmk3** occurs above a very small portion of the SBSmh.

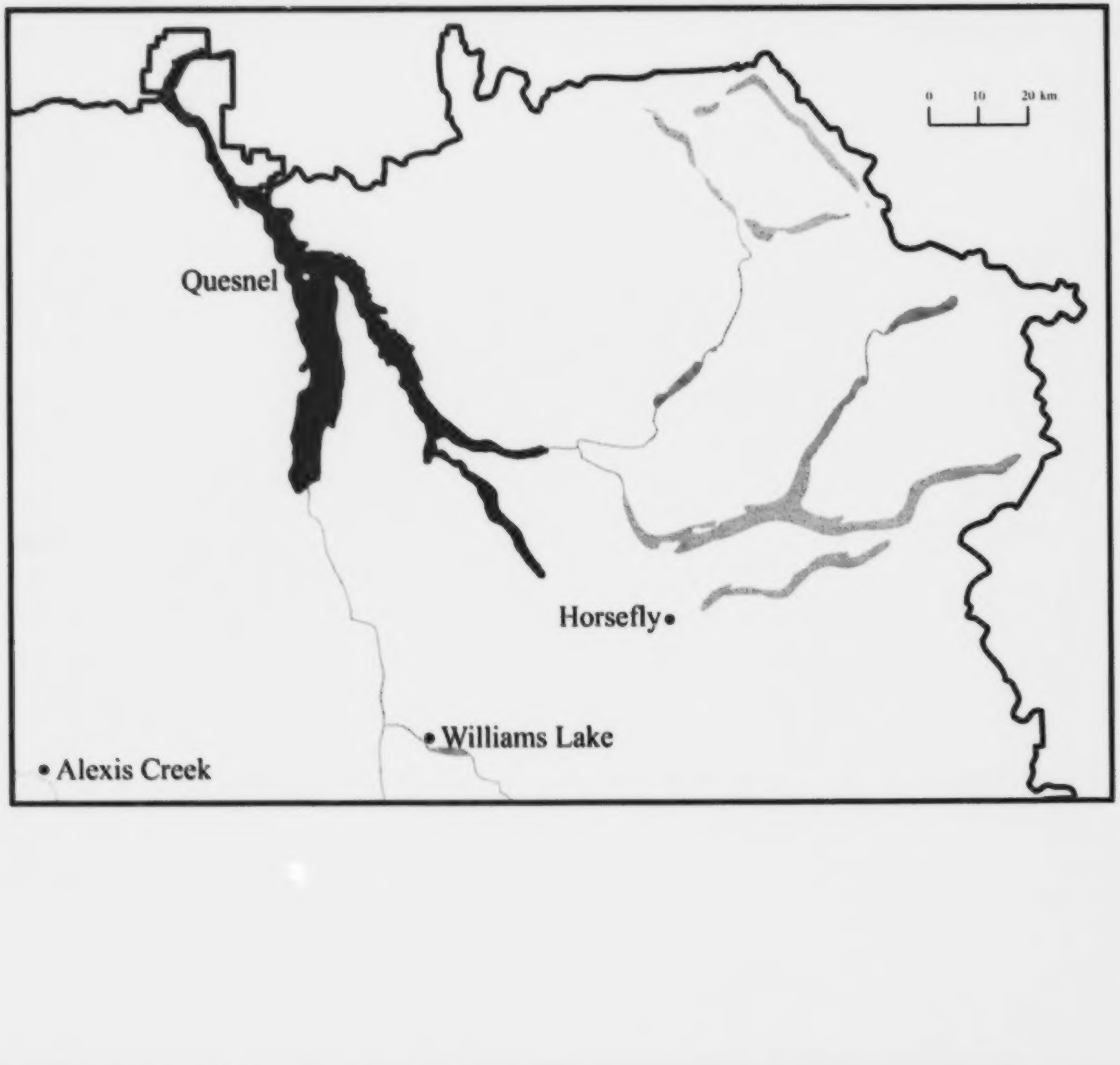
In the **SBSmw**, zonal sites have:
- common foamflower, rosy twistedstalk, lodgepole pine, queen's cup, and black huckleberry;
- no beaked hazelnut;
- uncommon Douglas maple and red-osier dogwood.

In the **SBSdw1** and **SBSdw2**, zonal sites have:
- common lodgepole pine, black huckleberry, and pinegrass;
- no beaked hazelnut or Hooker's fairybells.

In the **IDFxm**, zonal sites have:
- pinegrass, kinnikinnick, spreading needlegrass, and bluebunch wheatgrass;
- no spruce, paper birch, beaked hazelnut, or red-osier dogwood.

In the **ICHmk3**, zonal sites have:
- redcedar and foamflower;
- no beaked hazelnut or red-osier dogwood.

Distribution of SBSmh Subzone in the Cariboo Forest Region


0
10
20 km
Quesnel
Horsefly
Williams Lake
Alexis Creek

Site Units of the SBSmh

Zonal Site Series **01 SxwFd - Hazelnut Site Series** occurs on gentle to moderate mid and lower slope positions and level benches. Soil parent materials are primarily loamy and fine sandy fluvial and lacustrine materials with low gravel content. The mature forest canopy is most often dominated by Douglas-fir but hybrid white spruce is usually present. Subalpine fir occurs in the canopy of mature stands in the northern part of the subzone. Deciduous forests (paper birch, cottonwood, and trembling aspen) are very common. Tree regeneration is predominantly spruce but all of the overstory species are usually present. The undergrowth has a relatively large number of species and a high percent cover of both shrubs and herbs. Common species include beaked hazelnut, Douglas maple, thimbleberry, prickly rose, wild sarsaparilla, cream-flowered peavine, common mitrewort, and rough-leaved ricegrass. Mosses cover a relatively small percentage of the surface. Electrified cat's-tail moss and red-stemmed feathermoss are most common.

Drier Sites Sites drier than those of the zonal site series are common on hill crests, steep south- and west-facing slopes, and coarse soils. In contrast to zonal and other mesic sites, they have kinnikinnick and early blue violet, more lichens, and little or no beaked hazelnut, trailing raspberry, or common mitrewort.

02 FdPl - Cladonia Site Series is relatively uncommon and occurs on shallow (<50 cm) soils over bedrock on the few ridge crests in the subzone. The mature forest canopy is dominated by relatively widely spaced Douglas-fir. Subalpine fir and paper birch are occasional components in sub-canopy layers. The undergrowth vegetation is sparse and includes common juniper, soopolallie, kinnikinnick, and early blue violet. Species common on mesic and wetter sites, including thimbleberry, black twinberry, and creamy peavine, are absent. The moss/lichen layer contains a moderate to high cover of red-stemmed feathermoss and wavy-leaved moss, and abundant cladonia lichens.

03 FdPl - Velvet-leaved blueberry - Cladonia Site Series occurs on level and gently sloping sites with coarse glaciofluvial soils, predominantly gravelly sands. It is uncommon. The mature forest canopy is typically dominated by lodgepole pine and Douglas-fir. The undergrowth vegetation includes a moderate cover of low and dwarf shrubs including kinnikinnick, soopolallie, common juniper, and velvet-leaved blueberry. The herbaceous layer is relatively sparse, but mosses, especially red-stemmed feathermoss and wavy-leaved moss, are abundant. The abundance of lodgepole pine and velvet-leaved blueberry distinguishes these sites from all others in the subzone.

04 Fd - Douglas maple - Step moss Site Series occurs on mid and upper slope positions of steep south- and west-facing slopes. It includes the warmest sites in the subzone. The mature forest canopy is dominated by Douglas-fir but occasionally includes scattered hybrid white spruce and subalpine fir. Tree regeneration is also dominated by Douglas-fir. Shrub and herb layers have a large diversity of species and typically high total percent ground cover. The presence of choke cherry, American vetch, and abundant showy aster, along with the absence or very low abundance of kinnikinnick and velvet-leaved blueberry, distinguish these sites.

05 SxwFd - Feathermoss Site Series includes mesic and submesic sites with gravelly loamy or sandy soils that are periodically moistened by intermittent seepage. They occur primarily on gentle mid to toe slope positions. The mature forest canopy is typically dominated by Douglas-fir and less often by hybrid white spruce. Subalpine fir is frequently present as a minor canopy species, especially in the northern part of the subzone. Tree regeneration is often dense and predominantly subalpine fir. Shrubs and herbs have a low to moderate abundance. Many of the species are the same as those of the /01 site series but abundance is significantly less. Feathermosses have a nearly continuous cover. The presence of common mitrewort and trailing raspberry distinguishes /05 sites from other site series drier than the /01.

Wetter Sites Sites wetter than the /01 site series are moderately common at the toe of slopes, on seepage slopes, and adjacent to streams. Forests on these sites are most often dominated by hybrid white spruce and are distinguished by relatively abundant ferns, clasping twistedstalk, and common horsetail.

06 SxwFd - Coltsfoot Site Series is relatively uncommon. It occurs from mid to toe slope positions where soils are moistened by intermittent seepage and on some moist low-lying flats without a near-surface water table. The mature forest canopy is dominated by hybrid white spruce and Douglas-fir, often with scattered lodgepole pine. The shrub layer is moderately dense and includes a large number of species, including red-osier dogwood, soopolallie, highbush-cranberry, and thimbleberry. Many herbaceous species are also present but none consistently has a high cover. The presence of coltsfoot, clasping twistedstalk, and western meadowrue distinguishes these sites.

07 SxwEp - Devil's club Site Series is common on lower and toe slope positions, especially adjacent to small streams. Most sites occur on north aspects where seepage volumes tend to be greater. Seepage is evidenced in the soil by mottled and occasionally gleyed lower soil horizons. The forest canopy of mature stands is dominated by hybrid white spruce and Douglas-fir, but black cottonwood and paper birch frequently form a significant component of the stand. Devil's club and ferns, including lady fern, dominate the undergrowth and distinguish these sites from other site series. The moss layer is typically poorly developed.

08 Sxw - Ostrich fern Site Series occurs primarily on medium- to fine-textured fluvial soils at the toe of slopes and on floodplains of streams. Due to seepage water inputs, soils are moist and nutrient regimes are rich. Stands are mostly small but very productive. The mature forest canopy is dominated by large, often widely spaced hybrid white spruce but also includes subalpine fir and cottonwood. The undergrowth vegetation includes many tall shrubs (especially mountain alder) and a nearly complete cover of forbs, including ostrich fern, stinging nettle, and enchanter's nightshade. The abundance of ostrich fern and the presence of stinging nettle distinguishes the mature vegetation. The moss layer is poorly developed.

09 Sxw - Horsetail - Glow moss Site Series is uncommon. It occurs locally on poorly drained flats and depressions where there is a near-surface (<50 cm) water table. The canopy of mature stands is relatively open, and dominated by hybrid white spruce, often with scattered subalpine fir, trembling aspen, or black cottonwood. The shrub layer has a low cover of several wet-site shrubs, including devil's club, mountain alder, and black twinberry, and a dense cover of horsetail species. Boreal feathermosses are restricted to raised microsites, while leafy mosses and liverworts are abundant in micro-depressions.

Non-forested Sites The natural landscape of the SBSmh is mostly forested but includes a few small wetlands. These are predominantly sedge fens, shrub fens, and transitional bogs, often with black spruce.

Key to Site Units of the SBSmh

1a. Soils shallow (<50 cm), bedrock usually exposed: slope position crest; moisture regime xeric.

SBSmh/02 FdPl - Cladonia

1b. Soils deeper; slope position not crest; moisture regime subxeric or wetter.

2a. Slope steep (>35 %) **and** aspect SE to W (rarely NW); American vetch and early blue violet present.

SBSmh/04 Fd - Douglas maple - Step moss

2b. Slope gentle (<35%) or if steep then aspect NW to N to E; American vetch and early blue violet absent or incidental.

3a. Moisture regime subxeric; soils rapidly drained gravelly sands; pinegrass, kinnikinnick, and dwarf blueberry present; sweet-scented bedstraw, common mitrewort, black gooseberry, and false Solomon's-seal absent or incidental.

SBSmh/03 FdPl - Velvet-leaved blueberry - Cladonia

3b. Moisture regime submesic or wetter; soils not rapidly drained and if gravelly sands then moistened by seepage inputs; kinnikinnick, pinegrass, and dwarf blueberry absent; sweet-scented bedstraw, common mitrewort, or false Solomon's-seal present.

4a. Moisture regime predominantly subhygric or hygric; palmate coltsfoot, clasping twistedstalk, western meadowrue, foamflower, common horsetail, or spiny wood fern present.

5a. Ostrich fern abundant (>30% cover) and large-leaved avens and northern golden-saxifrage present; usually on floodplains subject to periodic flooding.

SBSmh/08 Sxw - Ostrich fern

5b. Ostrich fern, large-leaved avens, and northern golden-saxifrage absent or incidental; usually not on floodplain.

6a. Moisture regime predominantly hygric; horsetail species abundant (>40% cover); soft-leaved sedge present.
SBSmh/09 Sxw - Horsetail - Glow moss

6b. Moisture regime predominantly subhygric; horsetail species absent or incidental (<1% cover); soft-leaved sedge absent.

7a. Devil's club cover >10% and spiny wood fern and foamflower present; combined cover of feathermosses generally <20%; soopolallie and showy aster absent.
SBSmh/07 SxwEp - Devil's club

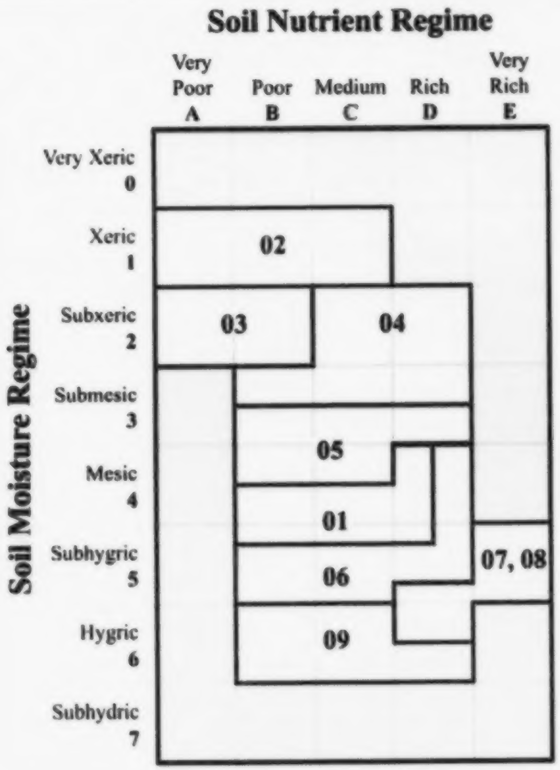
7b. Devil's club, spiny wood fern, and foamflower absent or incidental; combined cover of feathermosses >30%; soopolallie and showy aster present.
SBSmh/06 SxwFd - Coltsfoot

4b. Moisture regime predominantly mesic; palmate coltsfoot, clasping twistedstalk, western meadowrue, ostrich fern, common horsetail, and spiny wood fern absent.

8a. Total moss cover >50%; prince's pine present; soils mostly gravelly (usually >35% coarse fragments).
SBSmh/05 SxwFd - Feathermoss

8b. Total moss cover <15%; prince's pine absent; soils mostly non-gravelly (<15% coarse fragments)
SBSmh/01 SxwFd - Hazelnut

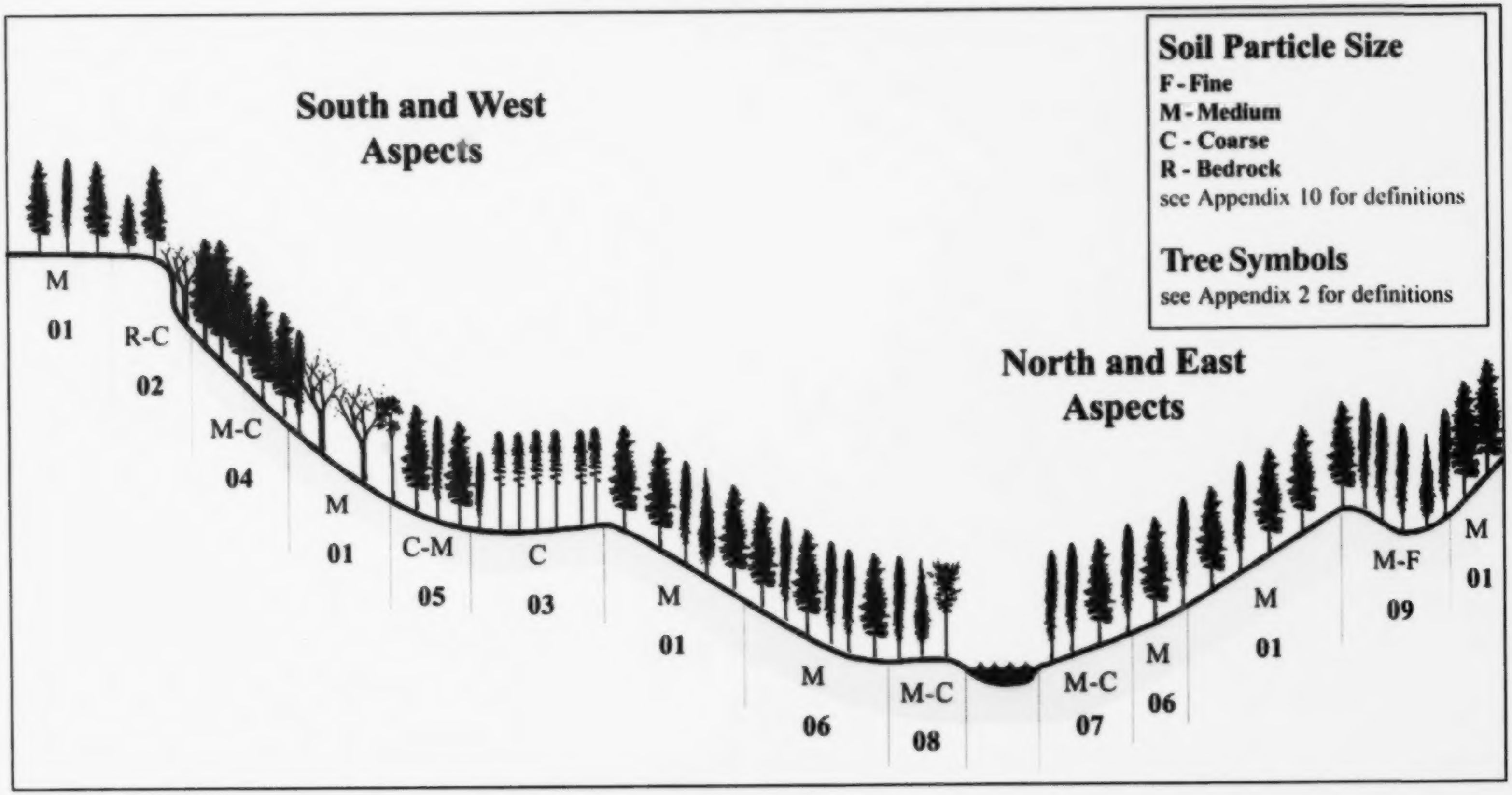
SBSmh Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
01
06
07, 08
09

Site Series

01	SxwFd - Hazelnut
02	FdPl - Cladonia
03	FdPl - Velvet-leaved blueberry - Cladonia
04	Fd - Douglas maple - Step moss
05	SxwFd - Feathermoss
06	SxwFd - Coltsfoot
07	SxwEp - Devil's club
08	Sxw - Ostrich fern
09	Sxw - Horsetail - Glow moss

SBSmh Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South and West Aspects
North and East Aspects
M 01
R-C 02
M-C 04
M 01
C-M 05
C 03
M 01
M 06
M-C 08
M-C 07
M 06
M 01
M-F 09
M 01

Site Features of SBSmh Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to moderately sloping sites with mesic or near mesic moisture regime	dry ridge crests and upper slopes with shallow (< 50 cm) soils over bedrock	gently sloping and level sites with coarse sandy soils, usually glaciofluvial materials	middle and upper slope positions on steep S- and W-facing slopes	level to moderately sloping mesic and submesic sites with gravelly soils
Soil Moisture / Nutrient Regimes	mesic, subhygric / poor - rich	xeric / very poor - medium	subxeric / very poor, poor	subxeric, submesic / poor - rich	submesic, mesic / poor - rich
Slope Position	upper - lower, level	crest	level, toe	upper, mid	mid, toe, level
Aspect	all	all	N/A	SE, S, SW, W	all
Slope Grade (%)	0 - 20	< 10	< 10	35 - 90	0 - 35, rarely to 70 on NW to E aspect
Soil Texture	loamy, silty, sandy	gravelly loamy, sandy	gravelly sandy	gravelly loamy and sandy	gravelly sandy or loamy (rarely silty)
Humus Form and Thickness (cm)	Hemimor, Mormoder, Mullmoder 3 - 15	Xeromor (Hemimor) 2 - 4	Xeromor, Hemimor 2 - 4	Hemimor, Mullmoder, Humimor 3 - 7	Humimor, Mullmoder, Hemimor 5 - 8
Occurrence / Size / Distribution	predominant / medium - large / wide	uncommon / small / wide	uncommon / medium / wide	common / medium - large / wide	common / medium - large / wide

Site Features of SBSmh Site Series (continued)

Site Series	06	07	08	09
Key Features	moist sites on lower, toe, and level slope positions with intermittent seepage	very moist, lower and toe slope sites on cool N and E aspects with persistent seepage; often adjacent to streams	very moist, toe and level slope positions with persistent seepage; often on current floodplain	wet depressions and level sites with near-surface (< 50 cm) water table
Soil Moisture / Nutrient Regimes	mesic, subhygric / poor - rich	subhygric, hygric / rich - very rich	subhygric, hygric / rich - very rich	hygric / poor - rich
Slope Position	lower (toe, level)	lower, toe (depression)	level, toe	depression, level
Aspect	all	NW, N, NE, E	all	N/A
Slope Grade (%)	< 10	0 - 50	< 10	< 5
Soil Texture	fine loamy	loamy, sandy	loamy, sandy	loamy, silty and clayey
Humus Form and Thickness (cm)	Hemimor, Humimor 6 - 12	Mormoder, Mullmoder 7 - 30	Vermimull, Mormoder 2 - 10	Histomoder, Hydromoder 15 - 40
Occurrence / Size / Distribution	uncommon / small / wide	common / medium / wide	uncommon / small / wide	uncommon / small / wide

SBSmh Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	09	
Tree Layer	*Pinus contorta*		▮▮▮▮▮				▮▮▮				lodgepole pine
	Pseudotsuga menziesii	▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮			Douglas-fir
	Betula papyrifera	▮▮	▮		▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	▮	▮▮▮	paper birch
	Picea engelmannii x glauca				▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	hybrid white spruce
	Abies lasiocarpa	▮▮▮			▮	▮	▮▮▮	▮▮▮	▮		subalpine fir
	Populus balsamifera							▮	▮	▮▮▮	black cottonwood
Shrub Layer	*Juniperus communis*	▮▮	▮								common juniper
	Vaccinium myrtilloides		▮▮▮								velvet-leaved blueberry
	Shepherdia canadensis	▮▮▮	▮▮▮▮	▮▮▮		▮▮▮	▮▮▮				soopolallie
	Acer glabrum	▮▮		▮▮▮	▮▮▮	▮▮▮		▮▮▮			Douglas maple
	Amelanchier alnifolia	▮▮	▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮			▮▮	saskatoon
	Cornus stolonifera			▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	red-osier dogwood
	Corylus cornuta				▮	▮▮▮▮	▮▮▮	▮▮▮▮			beaked hazelnut
	Oplopanax horridus				▮			▮▮▮▮▮	▮▮▮	▮▮▮	devil's club
	Alnus tenuifolia							▮▮▮	▮▮▮▮▮		mountain alder
	Sambucus racemosa							▮	▮▮▮		red elderberry
	Ribes glandulosum								▮▮		skunk currant
Herb Layer	*Arctostaphylos uva-ursi*	▮▮	▮▮▮▮▮								kinnikinnick
	Viola adunca	▮▮	▮	▮▮							early blue violet
	Chimaphila umbellata	▮▮	▮▮	▮	▮▮▮	▮	▮▮			▮▮	prince's pine
	Smilacina racemosa	▮▮		▮▮	▮▮	▮▮	▮▮	▮▮	▮	▮▮	false Solomon's-seal
	Dryopteris expansa							▮▮▮	▮		spiny wood fern
	Galium triflorum				▮▮	▮▮	▮▮	▮▮	▮▮	▮▮	sweet-scented bedstraw
	Mitella nuda				▮▮▮	▮▮	▮▮	▮▮	▮▮	▮▮▮	common mitrewort
	Streptopus amplexifolius						▮▮	▮▮	▮▮	▮▮	clasping twistedstalk
	Thalictrum occidentale						▮▮▮		▮▮		western meadowrue
	Tiarella trifoliata							▮▮	▮▮		one-leaved foamflower
	Equisetum spp.							▮▮	▮▮▮▮	▮▮▮▮▮	horsetails
	Chrysosplenium tetrandum								▮▮		northern golden-saxifrage
	Matteuccia struthiopteris								▮▮▮▮▮		ostrich fern
	Carex disperma									▮▮	soft-leaved sedge
Moss Layer	*Aulacomnium androgynum*	▮▮									lover's moss
	Cladina spp.	▮▮▮	▮	▮							reindeer lichens
	Cladonia spp.	▮▮	▮								cladonia lichens
	Dicranum polysetum	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮				wavy-leaved moss
	Hylocomium splendens	▮▮▮		▮▮▮▮▮	▮▮▮▮	▮	▮▮▮				step moss
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮		▮▮▮▮	red-stemmed feathermoss
	Ptilium crista-castrensis		▮		▮▮▮	▮	▮▮▮	▮		▮▮▮	knight's plume
	Mnium spp.					▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮	leafy mosses
	Brachythecium spp.					▮	▮▮	▮▮▮	▮▮▮	▮▮	ragged mosses

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

SBSmm
SUB-BOREAL SPRUCE
MOIST MILD SUBZONE

The SBSmm occurs primarily in the Kamloops Forest Region. It includes only a very small area (87 km^2) in the Cariboo Forest Region along the Kamloops Forest Region boundary south of Canim Lake. Elevations in the Cariboo Forest Region are predominantly 1250–1350 m.

Distinguishing Adjacent Units from the SBSmm (Cariboo Forest Region only)

The **SBSdw1** occurs below the SBSmm along most of its boundary in the Cariboo Forest Region. In the relatively dry climate along Canim Lake, a small area of the **IDFmw2** occurs below the SBSmm, while in the relatively moist climate northeast of Lorin Lake, a small area of the **ICHmk3** occurs below the SBSmm. The **ESSFdc2** occurs above the SBSmm throughout its distribution in the Cariboo Forest Region. The **SBSmc1** replaces the SBSmm at similar elevations west of Bowers Lake and in the Jim Creek watershed.

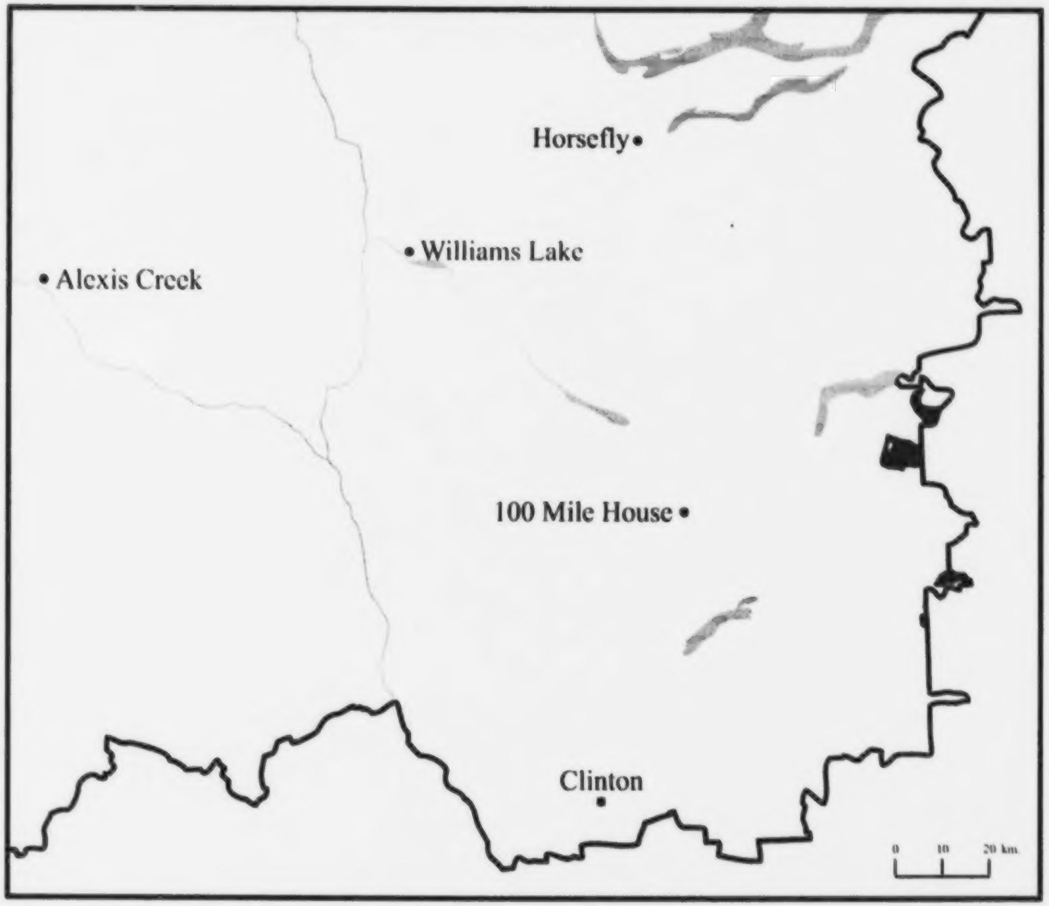
In the **SBSdw1**, zonal sites have:
- common pinegrass;
- little or no subalpine fir in forest canopy;
- no five-leaved bramble.

In the **IDFmw2**, zonal sites have:
- Douglas-fir climax forests;
- no subalpine fir;
- no bunchberry or black huckleberry.

In the **ICHmk3**, zonal sites have:
- redcedar in canopy of climax forests;
- common Douglas-fir (seral).

In the **ESSFdc2**, zonal sites have:
- white-flowered rhododendron and Sitka valerian;
- little or no falsebox.

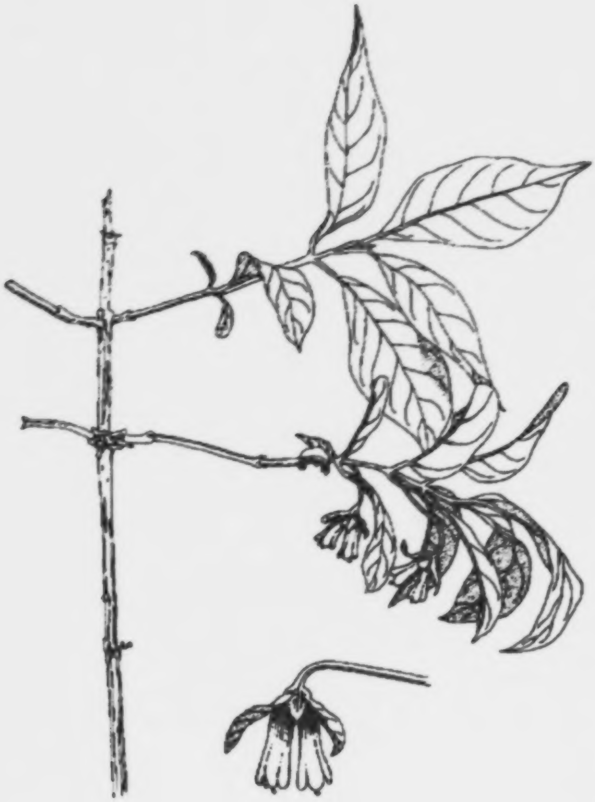
Distribution of SBSmm Subzone in the Cariboo Forest Region


Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clinton
0
10
20 km

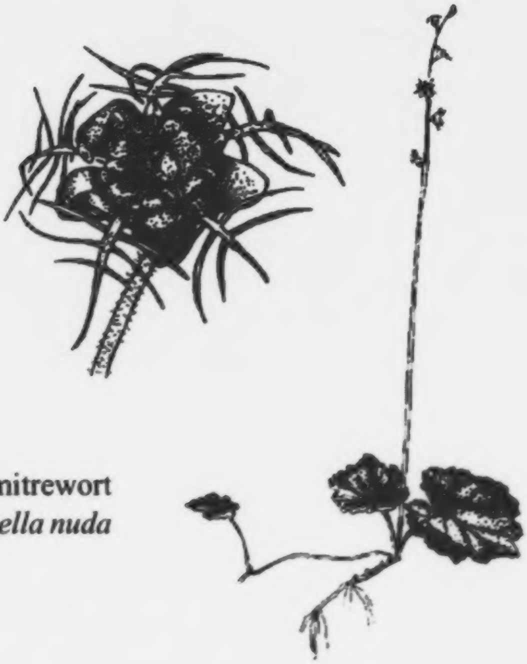
In the **SBSmc1**, zonal sites have:
- many similarities to the SBSmm;
- less falsebox, black twinberry, palmate coltsfoot, and stiff clubmoss;
- less Douglas-fir (seral).

Site Units of the SBSmm

A site unit classification for the SBSmm has been developed for the Kamloops Forest Region by Lloyd *et al.* (1990). Although not field tested in this region, it is anticipated that this classification applies as well to the Cariboo Forest Region portion of the SBSmm. Consult Lloyd *et al.* (1990) for a description of site units.



Black twinberry
Lonicera involucrata



Common mitrewort
Mitella nuda

SBSmw
SUB-BOREAL SPRUCE
MOIST WARM SUBZONE

The SBSmw is in the northeast portion of the Cariboo Forest Region and adjacent portions of the Prince George Forest Region. In the Cariboo Forest Region (1374 km^2), it extends eastward from the Quesnel River across the gently rolling landscapes of the Fraser Plateau to the western edge of the Quesnel Highland. It also occurs along the east side of the Fraser River north of the confluence of the Fraser and Cottonwood rivers. Elevations range from about 700 to 1000 m.

Distinguishing Adjacent Units from the SBSmw

The **SBSwk1** occurs at higher elevations along most of the eastern boundary of the SBSmw where precipitation is greater and temperatures are cooler. The **SBSmh** occurs along the western boundary of the SBSmw in the Quesnel and Fraser river valleys where mean annual temperatures are warmer. A small area of the **SBSdw1** borders the SBSmw near Ten Mile Lake, north of Quesnel. The **ICHmk3** shares a short border with the SBSmw, south of Quesnel Forks, and the **ICHwk2** borders a very small section of the SBSmw boundary near the west end of Quesnel Lake.

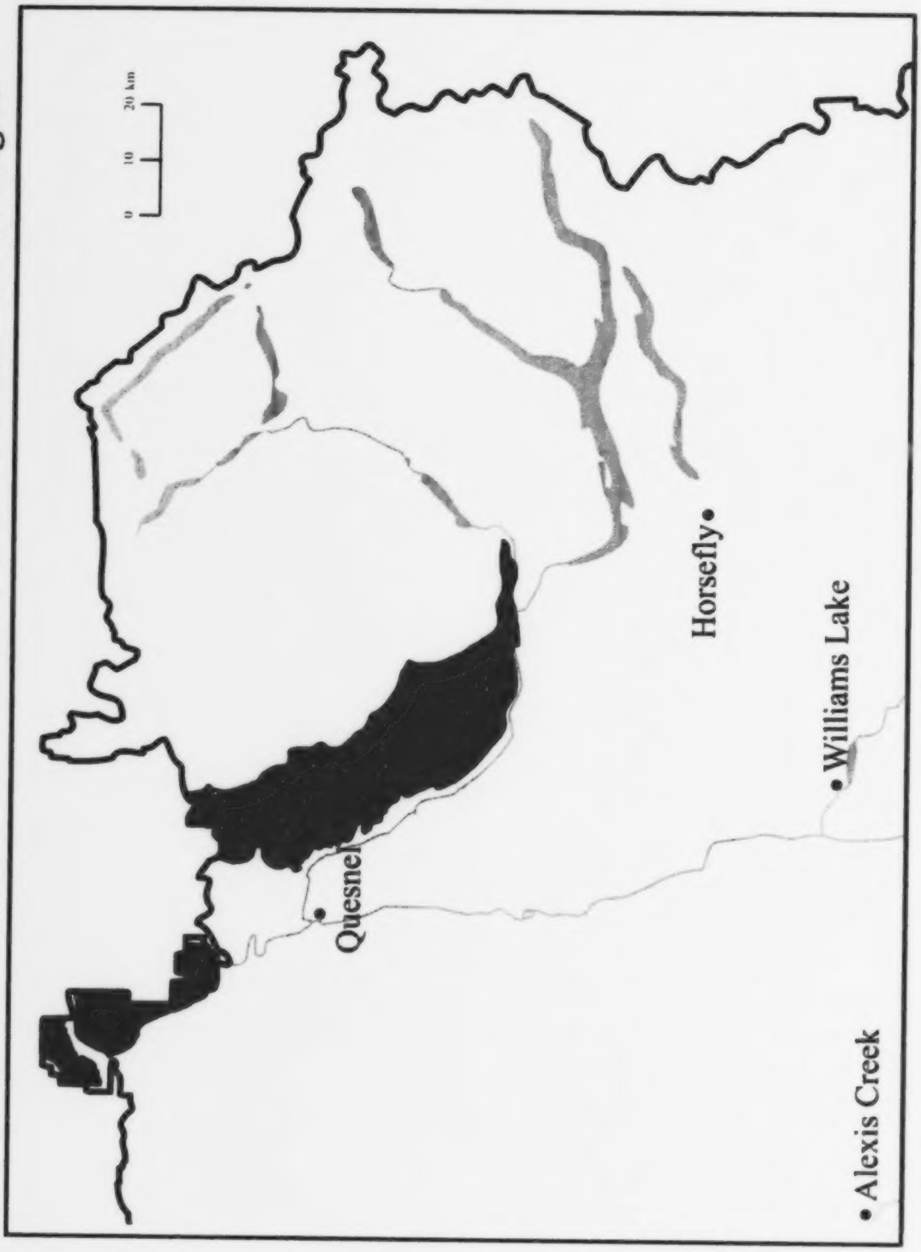
In the **SBSwk1**, zonal sites have:
- abundant oak fern, three-leaved foamflower, and five-leaved bramble;
- little or no Douglas-fir.

In the **SBSmh**, zonal sites have:
- beaked hazelnut;
- common Douglas maple and red-osier dogwood;
- little or no foamflower, rosy twistedstalk, lodgepole pine, queen's cup, or black huckleberry.

In the **SBSdw1**, zonal sites have:
- pinegrass or blue wildrye;
- no rosy twistedstalk, one-leaved foamflower, or five-leaved bramble.

In the **ICHmk3**, zonal sites have:
- western redcedar and five-leaved bramble;
- no western mountain-ash, showy aster, or trailing raspberry.

Distribution of SBSmw Subzone in the Cariboo Forest Region


0
10
20 km
Quesnel
Horsefly
Williams Lake
Alexis Creek

In the **ICHwk2**, zonal sites have:

- western redcedar and western hemlock;
- common oak fern, three-leaved foamflower, and five-leaved bramble.

Site Units of the SBSmw

Zonal Site Series **01 SxwFd - Falsebox Site Series** is the predominant site unit of the SBSmw on gentle to moderately steep, lower to upper slope positions and level sites with medium-textured soils. The climax forest canopy is dominated by hybrid white spruce and subalpine fir, although Douglas-fir is common as a long-lived seral species. Due to past fires, seral lodgepole pine and Douglas-fir stands are common. In all stands, subalpine fir is the most abundant species of tree regeneration. The undergrowth vegetation has a moderate cover of low shrubs, especially black huckleberry, falsebox, and thimbleberry. The herbaceous layer has few grasses but a moderate cover of forbs, including bunchberry, twinflower, queen's cup, wild sarsaparilla, and heart-leaved arnica. Moss cover is nearly continuous and dominated by red-stemmed feathermoss, knight's plume, step moss, and electrified cat's-tail moss.

Drier Sites Sites drier than the zonal site series are moderately common, occurring on ridge tops, shallow soils, sandy soils and steep south-facing slopes. Lichens and juniper haircap moss are more abundant than on mesic sites but moist site species such as black twinberry, foamflower, star-flowered Solomon's-seal, and trailing raspberry are uncommon.

02 FdBl - Huckleberry Site Series occurs on upper slopes and ridge tops where soils are very shallow (<20 cm) over bedrock. Sites are mostly small, and the vegetation is distinguished by abundant lichens and *Dicranum* mosses. The mature forest canopy is typically dominated by short Douglas-fir and lodgepole pine. Low shrubs, especially black huckleberry, are abundant. Several herbaceous species are present but none is abundant, and total herb cover is sparse to moderate. Mosses, principally red-stemmed feathermoss, wavy-leaved moss, and juniper haircap moss, cover about 50% of the surface.

03 Pl - Huckleberry - Velvet-leaved blueberry Site Series is common on level to gently sloping, dry sandy soils, usually glaciofluvial terraces and outwash. Soil gravel contents are usually very high. The mature forest canopy is typically dominated by lodgepole pine with an understory of subalpine fir and hybrid white spruce. In areas of cold air accumulation, black spruce is occasional. The undergrowth vegetation is distinguished by the presence of velvet-leaved blueberry, which, together with black huckleberry, bunchberry, and twinflower, typically dominates the undergrowth. In contrast to the /02 site series, feathermosses are abundant, and cladonia and cladina lichens cover only a very small portion of the surface.

04 SxwFd - Knight's plume Site Series occurs on moderate to steep (>30%) south- and west-facing upper slopes. Soils are medium-textured but have a high gravel content. It is also present on broad ridge tops and gentler upper slopes where soils are shallow (<50 cm) to bedrock but deeper and more continuous than in the /02 site series. The mature forest canopy is typically dominated by Douglas-fir and occasionally by lodgepole pine. Tree regeneration is typically dense and predominantly subalpine fir. The undergrowth vegetation has a sparse to moderate cover of low shrubs (especially falsebox, saskatoon, and black huckleberry), and a sparse cover of herbaceous species. Mosses, especially red-stemmed feathermoss and knight's plume, typically cover 50% or more of the surface. The vegetation is distinguished from other dry sites by abundant mosses, few or no cladonia and cladina lichens, and little or no velvet-leaved blueberry.

Wetter Sites Sites wetter than the /01 site series are common on lower slopes, valley bottom flats, and riparian areas, and in small depressions. The vegetation is distinguished from /01 and drier sites by black gooseberry, lady fern, oak fern, bluejoint, and pink spirea.

05 Sxw - Pink spirea Site Series is common in the Sundberg Lake and Umiti Creek areas on moist lower slopes and shallow depressions where cold air accumulates, primarily adjacent to wetlands and in low-relief basins. Summer frost is frequent, and soils are relatively cold. The mature forest canopy is dominated by widely spaced lodgepole pine or occasionally by hybrid white spruce. Tree regeneration is generally sparse. The undergrowth vegetation is distinguished by its vigorous shrub layer dominated by pink spirea, willows, and black twinberry. Labrador tea is also frequently present. Common herbs and dwarf shrubs include bluejoint, creeping-snowberry, palmate coltsfoot, and twinflower. Moss cover is discontinuous and often includes sphagnum mosses.

06 Sxw - Oak fern Site Series is common on lower and toe slope positions where soils are moistened by intermittent, low-volume seepage water from upslope areas. The mature forest canopy is typically dominated by hybrid white spruce, lodgepole pine and subalpine fir, and the understory layers by relatively dense subalpine fir regeneration. Low shrubs are moderately abundant and principal species are black huckleberry, black twinberry, and black gooseberry. The herbaceous layer includes abundant oak fern, which, together with the low abundance of black twinberry and devil's club, distinguishes the vegetation from other site series.

07 Sxw - Twinberry - Oak fern Site Series occurs on moist lower and toe slope positions, primarily along stream channels. Persistent seepage water or a water table is usually evident within 50–100 cm of the surface, and sites are mostly in cold air accumulation areas. The mature forest canopy is dominated by widely spaced hybrid white spruce trees over a subcanopy of subalpine fir. The shrub layer is usually dense and dominated by black twinberry and thimbleberry. Abundant black twinberry distinguishes these sites. The herbaceous layer includes many low and medium-sized forbs with moderate cover. Oak fern and lady fern are usually abundant.

08 Sxw - Devil's club Site Series is common on lower and toe slope positions where soils are moistened by persistent seepage. Subsoils are usually strongly mottled and often gleyed. In contrast to the /07 unit, the /08 unit does not occur on sites with substantial cold air accumulations. The mature forest canopy is dominated by a mixture of hybrid white spruce and subalpine fir. The undergrowth is dominated by and distinguished by abundant devil's club and ferns, including lady fern, spiny wood fern, and oak fern.

09 Sxw - Horsetail Site Series occurs on gentle toe slopes and in depressions with a persistent near-surface (<50 cm) water table. Soils are typically Organics or Gleysols with thick surface organic horizons. The mature forest canopy is predominantly widely spaced hybrid white spruce with a small component of subalpine fir. Trees are often rooted on raised microsites. The undergrowth is distinguished by abundant (>5% cover) horsetail species. Several other wet-site species, such as mountain alder, lady fern, great northern aster, soft-leaved sedge, and leafy mosses, are also common.

10 SbSxw - Scrub birch - Sedge Site Series occurs in wet depressions where a water table is near the surface (<50 cm). These are primarily forested wetlands that have organic soils. The mature forest canopy is relatively open and dominated by black spruce and often includes lesser amounts of hybrid white spruce and lodgepole pine. The undergrowth is distinguished by a significant (>5%) cover of sphagnum moss as well as other typical bog species including scrub birch, Labrador tea, bog willow, bog cranberry, and a variety of sedges.

Non-forested Sites Wetlands are common in depressions in gently rolling terrain and along low-gradient streams. Fens are the predominant wetland type, although bogs and swamps are also present.

KEY TO SITE UNITS OF THE SBSmw

1a. Soils <50 cm deep over bedrock and no evidence of seepage water; usually crest or upper slope position; bedrock outcrops often present.

  2a. Soils extremely shallow, mostly <20 cm to bedrock; moisture regime very xeric or xeric; combined cover of cladonia and cladina lichens >2%; bedrock usually exposed.
  SBSmw/02 FdBl - Huckleberry

  2b. Soils mostly 20–50 cm deep; moisture regime xeric or subxeric; combined cover of cladonia and cladina lichens <2%; bedrock may or may not be exposed.
  SBSmw/04 SxwFd - Knight's plume

1b. Soils deeper or evidence of near-surface seepage water present; slope position various; bedrock outcrops seldom present.

  3a. Soil texture sand or loamy sand and no persistent seepage water or water table within 100 cm of surface; mostly level or gently sloping fluvial or glaciofluvial parent materials.

    4a. Velvet-leaved blueberry common (5–50 % ground cover) and oak fern absent or incidental; slope position generally level or mid and moisture regime submesic.
    SBSmw/03 Pl - Huckleberry - Velvet-leaved blueberry

4b. Velvet-leaved blueberry absent or incidental and oak fern cover >10%; slope position generally lower, and moisture regime mesic to subhygric.
SBSmw/06 Sxw - Oak fern

3b. Soils not sandy or, if so, then persistent seepage or water table within 100 cm of surface; slope position various.

5a. Slope gradient 30% or greater **and** slope aspect SE, S, SW or W.
SBSmw/04 SxwFd - Knight's plume

5b. Slope gradient <30% or if steeper then aspect NW, N, NE, or E.

6a. Moisture regime submesic, mesic, or subhygric; no persistent seepage or water table within 50 cm of surface.

7a. Oak fern cover >10%; moisture regime mesic or subhygric.
SBSmw/06 Sxw - Oak fern

7b. Oak fern cover <10%; moisture regime predominantly submesic or mesic.
SBSmw/01 SxwFd - Falsebox

6b. Moisture regime subhygric or wetter; evidence of seepage water inputs or water table within 50 cm of surface.

8a. Moisture regime subhygric; no water table within 50 cm of surface; slope position lower or toe.

9a. Pink spirea cover 5% or greater; oak fern absent or incidental; predominantly in cold air accumulation basins.
SBSmw/05 Sxw - Pink spirea

9b. Pink spirea cover <5%; oak fern usually abundant; site variable but not in cold air accumulation basin (may be cold air drainage area in gently sloping valley bottoms).

10a. Devil's club cover 5% or greater in mature forest; black twinberry and thimbleberry cover each <5%; lower and toe slope positions without significant cold air accumulation.
SBSmw/08 Sxw - Devil's club

10b. Devil's club cover <5%; black twinberry or thimbleberry cover >5%; predominantly toe slope positions along stream channels; cold air accumulation sites.
SBSmw/07 Sxw - Twinberry - Oak fern

8b. Moisture regime hygric or wetter; persistent water table within 50 cm of soil surface; slope position lower, toe, or depression.

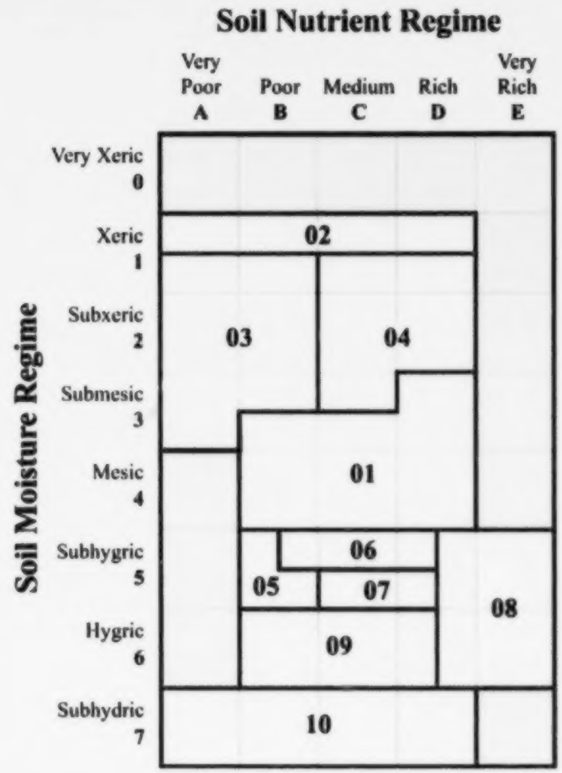
11a. Devil's club cover >5%; mostly seepage sites along stream channels.
SBSmw/08 Sxw - Devil's club

11b. Devil's club cover <5%; high water table sites mostly in depressions or adjacent to non-forested wetlands.

12a. Surface organic layers <50 cm thick over mineral soil; common horsetail cover >5% and sphagnum moss cover generally <5%.
SBSmw/09 Sxw - Horsetail

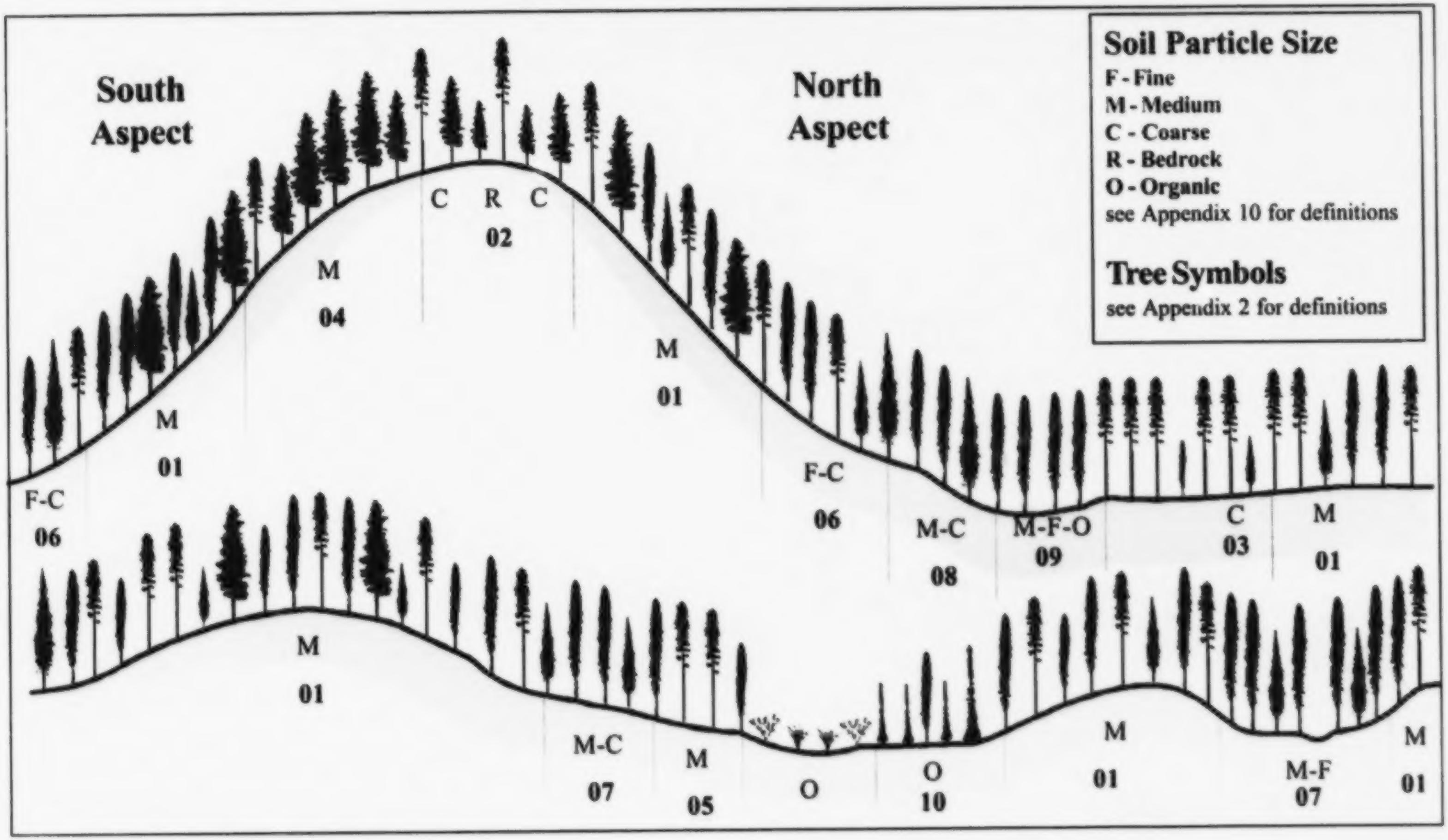
12b. Surface organic layers 50 cm or more thick over mineral soil; common horsetail and sphagnum moss cover >5%.
SBSmw/10 SbSxw - Scrub birch - Sedge

SBSmw Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
01
06
05
07
08
09
10

Site	Series
01	SxwFd - Falsebox
02	FdBl - Huckleberry
03	Pl - Huckleberry - Velvet-leaved blueberry
04	SxwFd - Knight's plume
05	Sxw - Pink spirea
06	Sxw - Oak fern
07	Sxw - Twinberry - Oak fern
08	Sxw - Devil's club
09	Sxw - Horsetail
10	SbSxw - Scrub birch- Sedge

SBSmw Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
F-C 06
M 01
M 04
C R C 02
M 01
F-C 06
M-C 08
M-F-O 09
C 03
M 01
M 01
M-C 07
M 05
O
O 10
M 01
M-F 07
M 01

Site Features of SBSmw Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to steeply sloping sites with mesic or near mesic moisture regime	dry crests and upper slopes with very thin (< 20 cm) soils over bedrock; bedrock usually exposed	gently sloping and level sites with dry sandy soils; no evidence of seepage input or water table	predominantly steep S- and W-facing upper slopes; also crest and upper slopes with shallow (21 - 50 cm) soils	moist sites in cold air accumulation basins, intermittent seepage or water table below 50 cm; often adjacent to wetlands
Soil Moisture / Nutrient Regimes	mesic (submesic-subhygric) / poor - rich	(very xeric) xeric / very poor - rich	xeric - submesic / very poor - poor	xeric - submesic / medium, rich	subhygric / poor
Slope Position	mid (upper - lower)	crest	level	crest, upper	toe, lower, level
Aspect	all	all	N/A	all	all
Slope Grade (%)	0 - 30 (70)	0 - 30	0 - 10	0 - 70	< 10
Soil Texture	gravelly loamy, sand, silty	gravelly loamy, sand	sand, gravelly sand	gravelly loamy	loamy, gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 3 - 8	Xeromor 1 - 3	Hemimor 2 - 5	Xeromor, Hemimor 2 - 8	Hemihumimor, Hydromor 6 - 16
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	common / medium / wide	uncommon / small / wide	locally common / small - medium / Sundberg Lake and Umiti Creek areas

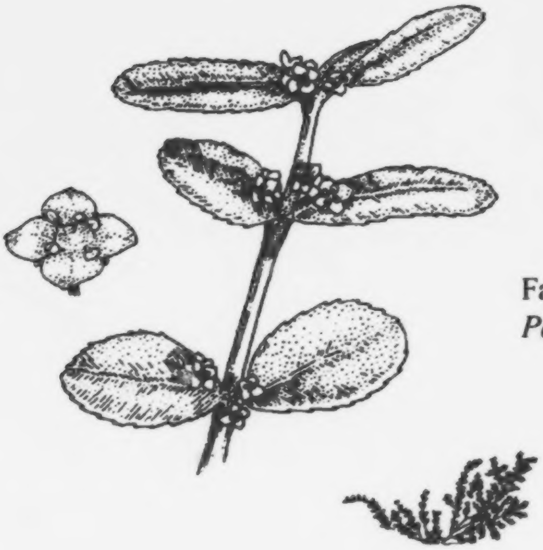
Site Features of SBSmw Site Series (continued)

Site Series	06	07	08	09	10
Key Features	moist, lower and toe slope positions with intermittent seepage; also on some moist level areas with silty or clayey soils	moist, lower and toe slope positions with seepage or water table below 50 cm; often in valley bottoms and along streams where cold air accumulates	moist lower slope positions with significant seepage inputs and better cold air drainage than /07; moist, rich, very productive sites	wet, level to gently sloping sites with near-surface (< 50 cm) water table and less than 50 cm of organic material over mineral soil	wet, level to gently sloping sites with near-surface (< 50 cm) water table and 50 cm or more of organic materials over mineral soil
Soil Moisture / Nutrient Regimes	subhygric / poor - rich	subhygric / medium, rich	subhygric (hygric) / rich, very rich	hygric / poor - rich	subhydric / very poor - rich
Slope Position	lower, level	lower, toe (middle)	lower, toe	toe, depression	depression
Aspect	all	all	all but predominantly N	all	N/A
Slope Grade (%)	0 - 20	0 - 20 (40)	5 - 50 (70)	0 - 5	0 - 5
Soil Texture	gravelly sand, loamy, silty, clayey	gravelly sand, loamy, silty	gravelly loamy, sand	loamy, silty, organic	organic
Humus Form and Thickness (cm)	Hemimor 3 - 12	Hemihumimor, Hydromoder 5 - 13	Hemihumimor, Hydromor 6 - 15	Hydromoder, Histomoder 5 - 50	Organic soils
Occurrence / Size / Distribution	common / medium / wide	common / medium / wide	common / medium - large / wide	uncommon / small - medium / wide	common / small / wide

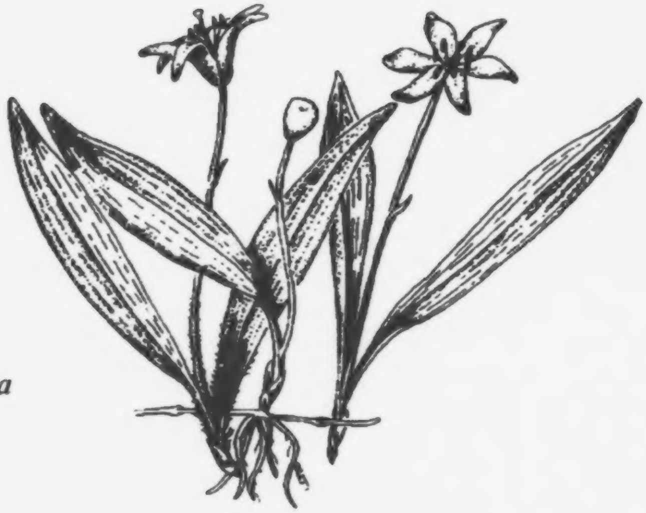
SBSmw Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	09	10	
Tree Layer	*Pseudotsuga menziesii*	▮▮▮▮▮	▮	▮▮▮▮▮	▮▮▮▮▮							Douglas-fir
	Pinus contorta	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮			▮	lodgepole pine
	Abies lasiocarpa	▮▮▮	▮▮▮	▮▮▮	▮▮▮		▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮		subalpine fir
	Picea engelmannii x glauca	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮		hybrid white spruce
	Picea mariana										▮▮▮▮	black spruce
Shrub Layer	*Vaccinium myrtilloides*		▮▮▮▮▮			▮▮						velvet-leaved blueberry
	Amelanchier alnifolia	▮▮▮	▮▮▮	▮▮	▮▮	▮▮				▮		saskatoon
	Pachistima myrsinites	▮▮▮	▮	▮▮▮	▮▮▮		▮					falsebox
	Vaccinium membranaceum	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮					black huckleberry
	Rubus parviflorus		▮	▮	▮▮▮		▮▮▮	▮▮▮▮▮	▮▮			thimbleberry
	Acer glabrum			▮▮	▮							Douglas maple
	Lonicera involucrata				▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮	black twinberry
	Alnus tenuifolia								▮	▮▮▮▮▮		mountain alder
	Spiraea douglasii					▮▮▮▮▮				▮	▮	hardhack
	Oplopanax horridus				▮		▮		▮▮▮▮▮	▮▮▮		devil's club
	Ledum groenlandicum									▮	▮▮▮▮	Labrador tea
Herb Layer	*Carex rossii*	▮▮										Ross' sedge
	Lycopodium complanatum		▮▮▮▮									ground-cedar
	Chimaphila umbellata	▮▮	▮▮▮	▮▮	▮▮							prince's pine
	Clintonia uniflora		▮▮▮		▮▮▮		▮▮▮	▮▮	▮▮			queen's cup
	Arnica cordifolia				▮▮▮			▮				heart-leaved arnica
	Smilacina stellata				▮		▮▮	▮▮	▮	▮▮▮		star-flowered false Solomon's-seal
	Mitella nuda				▮▮		▮▮	▮	▮▮	▮▮▮	▮▮	common mitrewort
	Gymnocarpium dryopteris				▮		▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮		oak fern
	Equisetum spp.					▮▮▮	▮	▮▮	▮▮	▮▮▮▮▮	▮▮▮	horsetails
	Circaea alpina							▮	▮▮▮	▮▮▮		enchanter's nightshade
	Carex disperma									▮▮▮	▮▮▮	soft-leaved sedge
	Potentilla palustris										▮▮	marsh cinquefoil
Moss Layer	*Cladina* spp.	▮▮▮	▮▮	▮▮								reindeer lichens
	Cladonia spp.	▮▮▮		▮▮								cladonia lichens
	Polytrichum spp.	▮▮▮▮		▮▮▮		▮▮▮						haircap mosses
	Peltigera aphthosa	▮▮▮	▮▮▮	▮▮	▮▮		▮▮	▮	▮▮		▮	freckle pelt
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	red-stemmed feathermoss
	Peltigera spp.	▮▮▮	▮▮▮	▮▮	▮				▮▮	▮		pelt lichens
	Ptilium crista-castrensis		▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	knight's plume
	Rhytidiadelphus triquetrus		▮	▮▮▮	▮▮▮▮		▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮		electrified cat's-tail moss
	Brachythecium spp.			▮	▮		▮▮	▮▮	▮▮▮	▮▮▮▮		ragged mosses
	Sphagnum spp.					▮▮▮▮▮				▮	▮▮▮▮▮	sphagnums
	Mnium spp.				▮		▮▮	▮▮	▮▮▮▮▮	▮▮▮▮▮		leafy mosses
	Tomenthypnum nitens										▮▮▮	golden fuzzy fen moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Falsebox
Pachistima myrsinities



Queen's cup
Clintonia uniflora

SBSwk1
SUB-BOREAL SPRUCE
WET COOL SUBZONE
WILLOW VARIANT

The SBSwk1 occurs in the northeastern portion of the Cariboo Forest Region and adjacent portions of the Prince George Forest Region. In the Cariboo Forest Region (1473 km^2), it dominates the rolling terrain along the western edge of the Quesnel Highland north of the Cariboo River. It also extends eastward in valley bottoms into the more dissected and rugged landscapes of the Quesnel Highland and Cariboo Mountains. The SBSwk1 occurs just below the ESSFwk subzone and has the highest precipitation and coolest temperatures of the SBS Zone in the Cariboo Forest Region. Elevations are generally 900–1250 m.

Distinguishing Adjacent Units from the SBSwk1

The **ESSFwk1** occurs above the SBSwk1 throughout its distribution in the Cariboo Forest Region. The **SBSmw** occurs below the SBSwk1 along most of its border, although the **ICHwk4** occurs below the SBSwk1 in the lower Cariboo River valley. The **ICHmk3** borders a small portion of the SBSwk1 near Spectacle Lake along the southwestern boundary of Bowron Park. It occurs at similar elevations but in apparently warmer climates than the SBSwk1.

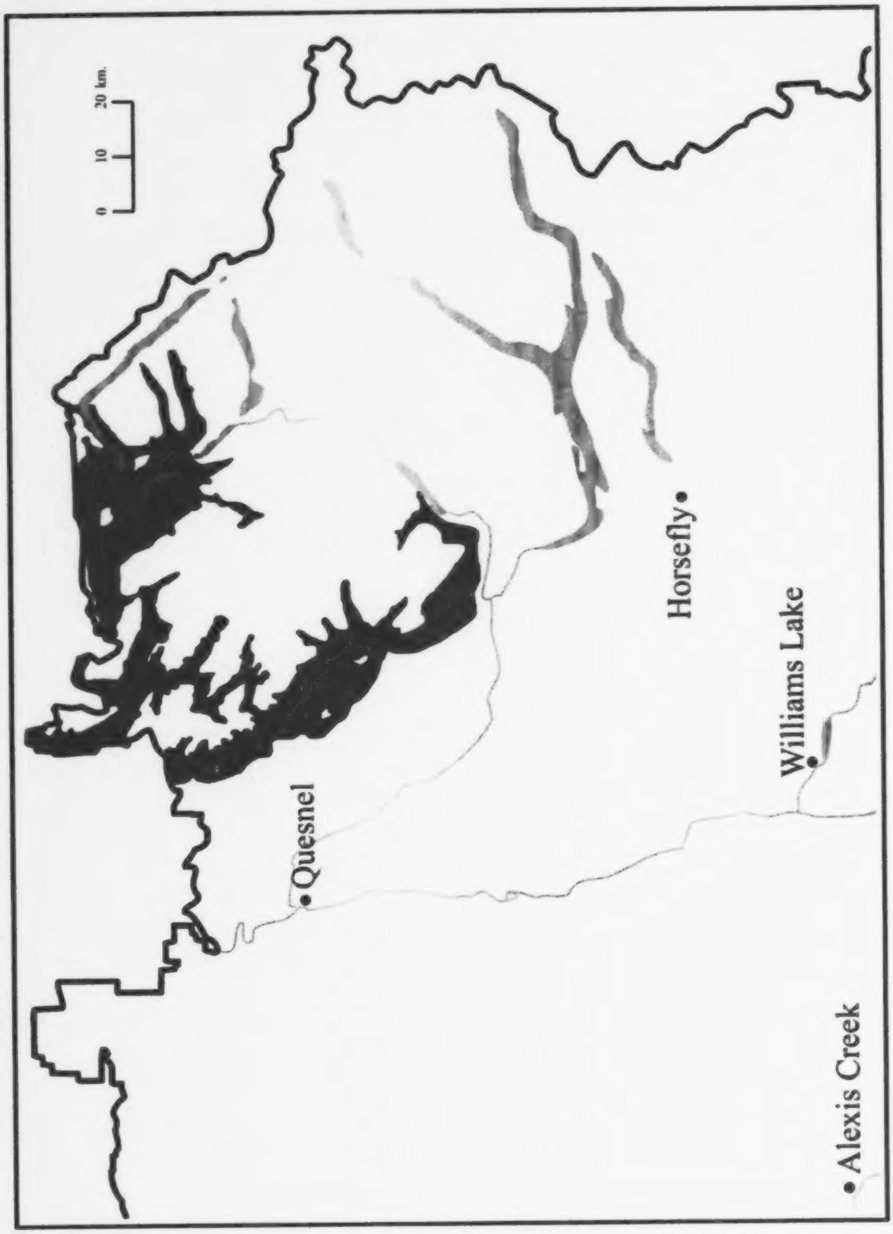
In the **ESSFwk1**, zonal sites have:
- white flowered rhododendron, red elderberry, and Sitka valerian.

In the **SBSmw**, zonal sites have:
- common Douglas-fir and prince's pine;
- little or no oak fern, three-leaved foamflower, or five-leaved bramble.

In the **ICHwk4**, zonal sites have:
- western redcedar and western hemlock;
- frequent Douglas-fir.

In the **ICHmk3**, zonal sites have:
- western redcedar and Douglas-fir;
- prince's pine;
- little or no oak fern.

Distribution of SBSwk1 Variant in the Cariboo Forest Region


0
10
20 km.
Quesnel
Horsefly
Williams Lake
Alexis Creek

Site Units of the SBSwk1

Zonal Site Series **01 Sxw - Oak fern Site Series** dominates the SBSwk1 landscape, occurring from upper to lower slope positions on medium-textured soils. It occurs on gentle and steep slopes and on all slope aspects. Climax tree species are hybrid white spruce and subalpine fir. Spruce is the principal canopy species, while subalpine fir is the principal tree species in the regeneration layer. Subalpine fir as well as lodgepole pine are often present in the canopy. Since wildfires have been less frequent than in other portions of the SBS in the Cariboo Region, lodgepole pine stands are also less common. The undergrowth of mature forests has a moderate cover of shrubs, consisting of several species. Black twinberry and black huckleberry are among the most abundant. The herbaceous layer has a moderate cover of low-growing species including oak fern, bunchberry, rosy twistedstalk, and stiff clubmoss. Moss cover is nearly continuous.

Drier Sites Sites drier than those of the zonal site series are moderately common, occurring on ridge tops, shallow soils, sandy soils, and steep south-facing slopes. These sites are distinguished by having more lodgepole pine, birch-leaved spirea, and western mountain-ash than do mesic and wetter sites. Moist-site species such as spiny wood fern, sweet-scented bedstraw, and leafy mosses are uncommon.

02 Pl - Huckleberry - Cladina Site Series occurs on upper slopes and ridge tops where bedrock is very near (<35 cm) the surface. These are small, localized sites with a vegetation distinguished by abundant ground lichens. The mature forest canopy is typically dominated by lodgepole pine or subalpine fir. Low shrubs, especially black huckleberry and dwarf blueberry, are abundant, but the herbaceous layer is typically sparse. Moss cover is relatively patchy, occurring mostly on microsites with deep soils.

03 Pl - Huckleberry - Velvet-leaved blueberry Site Series occurs on dry sands, including dry glaciofluvial terraces, as well as on dry upper and crest slope positions where soils are shallow (<80 cm) but deeper than those of the /02 unit. Slopes range from level to steep, but are most commonly level sandy terraces. The mature forest canopy is most often dominated by lodgepole pine with an understory of hybrid white spruce and subalpine fir. The undergrowth vegetation is distinguished by abundant velvet-leaved blueberry, which, together with black huckleberry, bunchberry, and twinflower, typically dominates the undergrowth. In contrast to most other site series, black gooseberry is absent. Feathermoss cover of the soil surface is nearly complete.

04 SxwFd - Knight's plume Site Series occurs primarily on steep (>30%) south- and west-facing slopes with deep, loamy soils that have a high coarse fragment content. Most soils contain coarse fragments more than 25 cm in diameter. This site series is also found on gentler south- and west-facing slopes where soils are moderately shallow (35–80 cm) to bedrock. The mature forest canopy is typically dominated by lodgepole pine with sparse hybrid white spruce and subalpine fir. The shrub layer is relatively dense and dominated by black huckleberry. The herb layer is relatively sparse, but feathermoss cover is nearly complete. The vegetation is distinguished from other sites by the presence of Douglas maple and the absence of velvet-leaved blueberry, three-leaved foamflower, and false Solomon's-seal.

05 Sxw - Huckleberry - Highbush-cranberry Site Series is the most common site series on submesic sites with loamy soils. It occurs on upper slope positions, on broad, rounded hill crests with deep soils, and on some steep south- and west-facing slopes where soils are deep and coarse fragment content is not high. The mature forest canopy is dominated by hybrid white spruce or lodgepole pine. Subalpine fir is by far the most abundant understory tree species. The undergrowth vegetation is similar to that of the /01 site series but is distinguished by having less abundant (<10% cover) oak fern, three-leaved foamflower, and leafy mosses.

Wetter sites Sites wetter than those of the zonal site series are very common in the SBSwk1 due to the relatively wet climate and large volumes of soil seepage water. They occur on lower slopes and in the bottoms of small valleys, on seepage areas, and along streams and wetlands. Compared to the zonal site series, they have less lodgepole pine, birch-leaved spirea, and black huckleberry but more spiny wood fern, sweet-scented bedstraw, and common horsetail.

06 Sxw - Pink spirea - Oak fern Site Series occurs on moist sites in cold air accumulation areas, primarily in small, shallow depressions adjacent to wetlands. The mature forest typically has a relatively open canopy dominated by hybrid white spruce and sparse tree regeneration. The undergrowth vegetation is distinguished by its vigorous low shrub layer, dominated by abundant pink spirea and black twinberry. The herbaceous layer is diverse, containing many species with more than 1% ground cover. Knight's plume moss covers most soil surfaces.

07 Sxw - Twinberry - Oak fern Site Series is found primarily on moist lower and toe slope positions along stream channels. These are often fluvial terraces and are typically cold air drainages. The mature forest canopy is typically dominated by large hybrid white spruce trees with a subcanopy of subalpine fir. The undergrowth is distinguished by a vigorous shrub layer, dominated by black twinberry and thimbleberry, and including red elderberry. Oak fern is abundant and, along with other ferns, dominates the herb layer. Moss cover is incomplete.

08 Sxw - Devil's club Site Series occurs on moist lower slopes where there is a nearly sustained, relatively high volume of seepage water flow near the surface. It typically does not occur in cold air accumulation areas. The mature forest canopy is dominated by a mixture of hybrid white spruce and subalpine fir with little or no lodgepole pine. The undergrowth is dominated by and distinguished by devil's club and ferns, including lady fern, spiny wood fern, and oak fern. Mosses cover less of the soil surface than in most other SBSwk1 sites.

09 Sxw - Horsetail Site Series occurs on level or gently sloping sites with a persistent near-surface (<50 cm) water table. These sites are primarily at the toe of slopes and are often adjacent to wetlands. Soils are typically Gleysols and, less commonly, Organics. The mature forest canopy is predominantly small, widely spaced hybrid white spruce with a small component of subalpine fir. Trees are often rooted on raised microsites. The undergrowth is distinguished by abundant (>5% cover) common horsetail. Common shrubs are black gooseberry and black twinberry.

10 Sxw - Devil's club - Lady fern Site Series occurs in the Prince George Forest Region but has not been recorded in the Cariboo Forest Region.

11 SbSxw - Scrub birch - Sedge Site Series occurs in wet depressions where a water table is near (<50 cm) the surface. These are primarily forested wetlands. The mature forest canopy is relatively open, and dominated by black spruce or white spruce. The undergrowth is distinguished by abundant (>5% cover) sphagnum moss.

Non-forested Sites Wetlands are common on the floor of small valleys and along gently sloping drainage channels. Sedge fens dominate the wetland area, although shrub fens and swamps are also present. Grasslands are virtually absent, and nearly all of the upland terrain is forested.

Key to Site Units of the SBSwk1

1a. Soils shallow (<80 cm) to bedrock and no significant seepage water input; slope position usually crest or upper; bedrock outcrops often present.

2a. Soils predominantly very shallow (<35 cm) over bedrock; slope position mostly crest; cladonia and cladina lichens abundant (>5% cover); moisture regime very xeric or xeric.
SBSwk1/02 Pl - Huckleberry - Cladina

2b. Soils predominantly deeper; bedrock often not exposed; slope position mostly upper, occasionally crest; cladonia and cladina lichens not abundant; moisture regime xeric or subxeric.

3a. Douglas maple cover >1% and velvet-leaved blueberry absent or incidental; slope gradient >20% **and** slope aspect predominantly south or west.
SBSwk1/04 SxwFd - Knight's plume

3b. Douglas maple cover <1%; velvet-leaved blueberry usually present; slope gradient <20% or, if steeper, then slope aspect predominantly north or east.
SBSwk1/03 Pl - Huckleberry - Velvet-leaved blueberry

1b. Soils deeper (>80 cm), or significant near-surface seepage water input; slope position various but seldom crest; bedrock outcrops usually not present;

4a. Soil texture sand or loamy sand, and no evidence of seepage water or water table within 100 cm of surface; slope position predominantly mid, upper, or level; velvet-leaved blueberry present.
SBSwk1/03 Pl - Huckleberry - Velvet-leaved blueberry

4b. Soil texture finer or, if sand, then evidence of seepage water or a water table within 100 cm of soil surface; slope position various; velvet-leaved blueberry usually absent or incidental.

5a. Slope gradient 30% or greater **and** slope aspect SE, S, SW, or W.

6a. Douglas maple cover >1%; soil coarse fragment content >50%, and large (>25 cm diameter) fragments common.
SBSwk1/04 SxwFd - Knight's plume

6b. Douglas maple absent or incidental; soil coarse fragment content <50%, or significant component of large fragments not present.
SBSwk1/05 Sxw - Huckleberry - Highbush-cranberry

5b. Slope gradient <30% or, if steeper, then slope aspect NW, N, NE, or E.

7a. Moisture regime predominantly submesic or mesic (occasionally subhygric in /01); no evidence of seepage water input or water table within 50 cm of soil surface.

8a. Moisture regime predominantly mesic; oak fern abundant (>10% cover).
SBSwk1/01 Sxw - Oak fern

8b. Moisture regime predominantly submesic; oak fern not abundant (<10% cover).
SBSwk1/05 Sxw - Huckleberry - Highbush-cranberry

7b. Moisture regime subhygric or wetter; evidence of seepage water inputs or water table within 50 cm of soil surface.

9a. Moisture regime subhygric or rarely hygric; persistent water table not present within 50 cm of soil surface; slope position level, mid, lower, or toe.

10a. Pink spirea cover 5% or greater; predominantly cold air accumulation basins near the perimeter of wetlands.
SBSwk1/06 Sxw - Pink spirea - Oak fern

10b. Pink spirea cover <5%; site variable but generally not in cold air accumulation basin.

11a. Devil's club cover >5% in mature forest; cover of black twinberry and thimbleberry variable; lower-slope seepage sites.
SBSwk1/08 Sxw - Devil's club

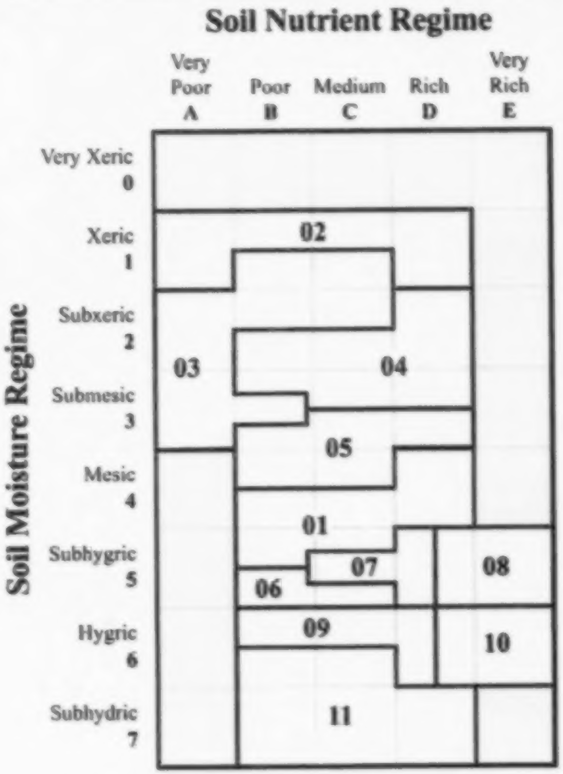
11b. Devil's club cover <5%; cover of black twinberry or thimbleberry >5%; mostly toe slope positions along stream channels.
SBSwk1/07 Sxw - Twinberry - Oak fern

9b. Moisture regime hygric or wetter; persistent water table within 50 cm of surface; slope position toe or depression.

12a. Surface organic layers <50 cm thick; common horsetail cover >5% and sphagnum moss cover <5%.
SBSwk1/09 Sxw - Horsetail

12b. Surface organic layers >50 cm thick; sphagnum moss and common horsetail cover each >5%.
SBSwk1/11 SbSxw - Scrub birch - Sedge

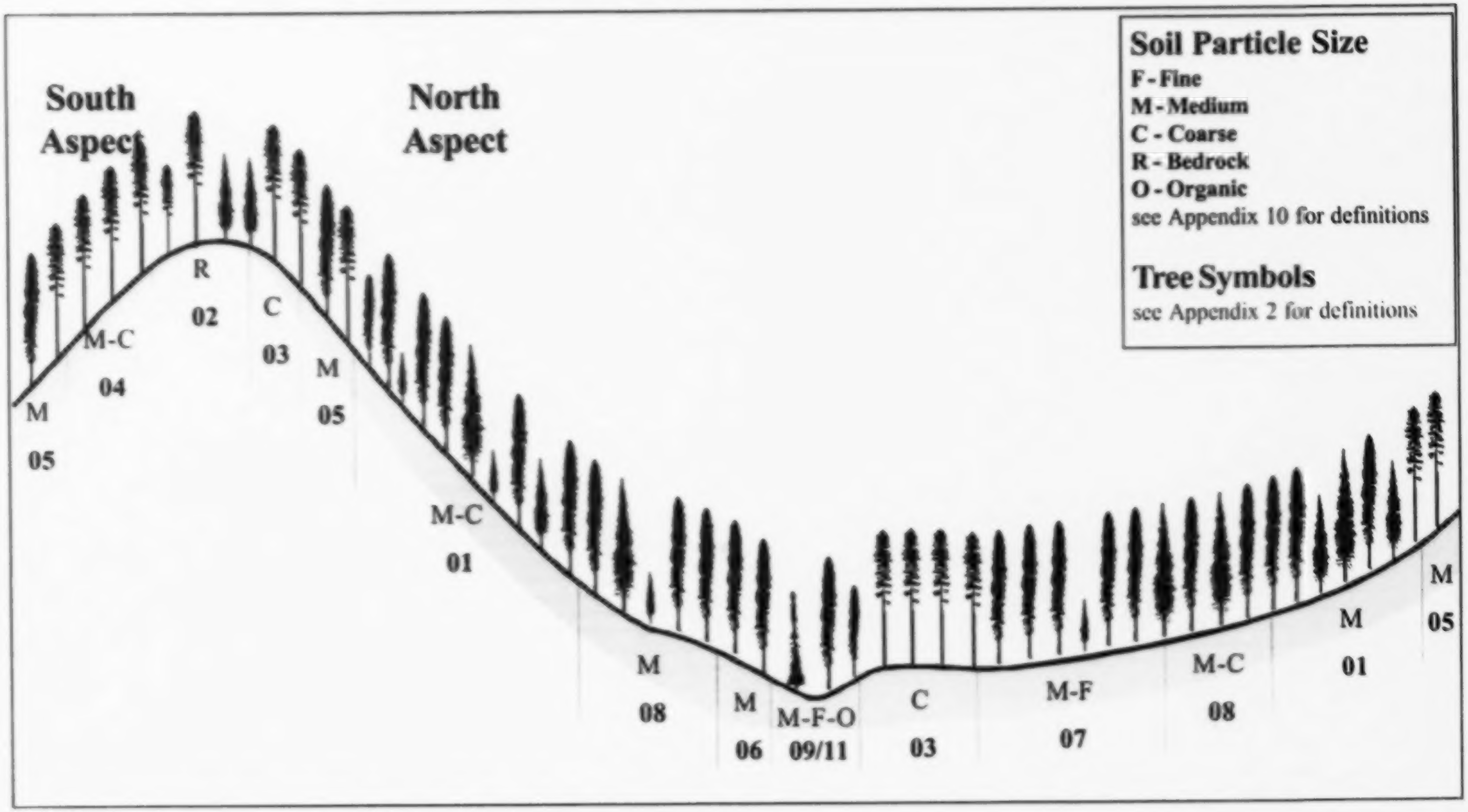
SBSwk1 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05
01
07
08
06
09
10
11

Site	Series
01	Sxw - Oak fern
02	Pl - Huckleberry - Cladina
03	Pl - Huckleberry - Velvet-leaved blueberry
04	SxwFd - Knight's plume
05	Sxw - Huckleberry - Highbush-cranberry
06	Sxw - Pink spirea - Oak fern
07	Sxw - Twinberry - Oak fern
08	Sxw - Devil's club
09	Sxw - Horsetail
11	SbSxw - Scrub birch - Sedge

Note: SBSwk1/10 occurs in the Prince George Forest Region but has not been noted in the Cariboo Forest Region.

SBSwk1 Landscape Profile


Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
South Aspect
North Aspect
M 05
M-C 04
R 02
C 03
M 05
M-C 01
M 08
M 06
M-F-O 09/11
C 03
M-F 07
M-C 08
M 01
M 05

Site Features of SBSwk1 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to steeply sloping sites with mesic or near-mesic moisture regime	very dry ridge and hill crests and upper slopes with very thin (< 35 cm) soils over bedrock; bedrock usually exposed	mostly dry sandy soils on gentle (some steep) slopes; also dry, shallow (40 - 80 cm) soils on N and E aspects and gentle S and W aspects	steep S and W aspects with shallow (40 - 80 cm) loamy soils or deep loamy soils that have a high coarse fragment content	wide range of submesic sites: upper slopes, broad crests, and gentle S and W aspects with deep loamy soils
Soil Moisture / Nutrient Regimes	mesic, subhygric / poor - rich	xeric / very poor - rich	xeric - submesic / very poor - medium	subxeric, submesic / poor - rich	submesic, mesic / poor - rich
Slope Position	upper - lower	crest	crest, upper, mid, level	mid, upper	upper, mid, level
Slope Aspect	all	all	all	SE, S, SW, W	all (N or E on steep slopes)
Slope Grade (%)	0 - 50 (70)	0 - 30	0 - 70	> 30	0 - 50 (70)
Soil Texture	gravelly loamy, sand, silty	gravelly loamy	sand, gravelly sand	loamy, gravelly loamy	loamy, gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 3 - 8	Xeromor 1 - 3	Hemimor, Xeromor 1 - 8	Hemimor 3 - 8	Hemimor 3 - 8
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	common / medium / wide	uncommon / small / wide	common / medium / wide

Site Features of SBSwk1 Site Series (continued)

Site Series	06	07	08	09	11
Key Features	moist sites in cold air accumulation basins, often adjacent to wetlands	moist, lower and toe slope positions; often on level to gently sloping sites adjacent to stream channels	very moist lower slope positions with significant seepage volumes; moist, rich sites	wet, level to gently sloping sites with near-surface (< 50 cm) water table and < 50 cm of peat over mineral soil	wet, level to gently sloping sites with near-surface (< 50 cm) water table and 50 cm or more of peat over mineral soil
Soil Moisture / Nutrient Regimes	subhygric / poor, medium	subhygric / medium, rich	subhygric / rich, very rich	hygric / poor - rich	hygric, subhydric / poor - rich
Slope Position	toe, lower	middle, lower, toe, level	lower, middle	toe, depression	depression
Slope Aspect	all	all	all, but mostly N	all	N/A
Slope Grade (%)	< 20	0 - 20 (40)	0 - 50	0 - 5	0 - 5
Soil Texture	loamy, gravelly loamy	gravelly loamy, silty	gravelly loamy, sand	loamy, silty	organic
Humus Form and Thickness (cm)	Hemimor 3 - 8	Hemimor, Mormoder 3 - 8	Hemihumimor, Hemimor 5 - 20	Hydromor 5 - 50	Organic soil
Occurrence / Size / Distribution	uncommon / small - medium / wide	common / medium / wide	common / medium - large / wide	uncommon / small - medium / wide	uncommon / small / wide

SBSwk1 Vegetation Table[a]

	Site Unit	02	03	04	05	01	06	07	08	09	11	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮	▮▮	▮			▮	lodgepole pine
	Abies lasiocarpa	▮▮▮	▮▮▮		▮▮▮▮	▮▮▮▮		▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮	subalpine fir
	Picea engelmannii x *glauca*		▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	hybrid white spruce
Shrub Layer	*Sorbus scopulina*	▮▮▮	▮	▮▮▮	▮▮	▮						western mountain ash
	Spiraea betulifolia	▮▮	▮▮▮	▮▮	▮▮▮	▮				▮		birch-leaved spirea
	Vaccinium membranaceum	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮		▮	▮	▮	▮	black huckleberry
	Vaccinium myrtilloides		▮▮▮▮				▮▮					velvet-leaved blueberry
	Amelanchier alnifolia		▮	▮▮▮	▮▮	▮▮	▮▮					saskatoon
	Acer glabrum			▮▮▮								Douglas maple
	Lonicera involucrata		▮	▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮	▮	▮▮	black twinberry
	Rubus parviflorus		▮	▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮			thimbleberry
	Spiraea douglasii						▮▮▮▮			▮	▮	hardhack
	Sambucus racemosa							▮▮▮	▮▮	▮		red elderberry
	Oplopanax horridus								▮▮▮▮▮			devil's club
	Ledum groenlandicum										▮▮▮	Labrador tea
	Betula glandulosa										▮▮▮▮	scrub birch
Herb Layer	*Clintonia uniflora*		▮	▮▮	▮▮▮	▮▮▮	▮▮		▮			queen's cup
	Aralia nudicaulis			▮▮▮	▮							wild sarsaparilla
	Gymnocarpium dryopteris	▮▮		▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮		oak fern
	Cornus canadensis	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮	▮▮▮	▮▮▮▮	▮▮▮	bunchberry
	Streptopus roseus	▮▮		▮▮	▮▮▮	▮▮▮	▮▮	▮▮▮	▮▮	▮▮▮		rosy twistedstalk
	Smilacina stellata				▮▮▮	▮		▮				star-flowered false Solomon's-seal
	Tiarella trifoliata				▮	▮▮	▮▮	▮▮▮	▮▮▮	▮▮▮		foamflower
	Smilacina racemosa				▮	▮	▮▮▮	▮▮	▮▮	▮		false Solomon's-seal
	Dryopteris expansa					▮	▮▮	▮▮▮	▮▮▮▮▮	▮▮▮		spiny wood fern
	Veratrum viride					▮▮▮	▮▮▮		▮			Indian hellebore
	Galium triflorum						▮▮▮	▮▮	▮▮	▮		sweet-scented bedstraw
	Equisetum spp.						▮▮	▮▮▮		▮▮▮▮▮	▮▮▮	horsetails
	Potentilla palustris										▮▮▮	marsh cinquefoil
	Carex disperma									▮	▮▮▮	soft-leaved sedge
Moss Layer	*Cladina* spp.	▮▮▮	▮▮▮									reindeer lichens
	Cladonia spp.	▮▮▮	▮	▮▮								cladonia lichens
	Dicranum spp.	▮▮▮▮	▮	▮▮			▮▮					heron's-bill mosses
	Peltigera spp.	▮▮▮	▮▮▮	▮▮	▮	▮	▮▮▮	▮	▮▮▮		▮▮	pelt lichens
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮▮	▮▮▮▮	red-stemmed feathermoss
	Hylocomium splendens	▮▮▮			▮▮▮▮	▮▮▮▮		▮	▮	▮▮▮▮	▮	step moss
	Brachythecium spp.			▮▮▮		▮▮	▮▮▮	▮▮▮	▮▮▮	▮		ragged mosses
	Rhytidiadelphus triquetrus				▮▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮		electrified cat's-tail moss
	Mnium spp.				▮	▮▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮		leafy mosses
	Sphagnum spp.									▮	▮▮▮▮	sphagnum

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

7 SILVICULTURE CONSIDERATIONS

Background

Role of the BEC System

Developing an effective silviculture prescription for a forest site requires the synthesis of many site and operational considerations, all within the context of the management objectives. The silviculturist must consider the potentials and principal limitations of the site as well as the results of previous prescriptions on similar sites. When the results of silviculture prescriptions are recorded in an organized manner by site characteristics, they can become the basis for the development and evolution of silviculture practices to better meet stand management objectives.

The Biogeoclimatic Ecosystem Classification (BEC) system provides a framework for organizing and communicating knowledge of site factors and how they affect success in achieving management objectives. It is an essential tool to assist the silviculturist in developing, adapting, and improving silviculture prescriptions to better meet management objectives.

The re-establishment of crop trees on a cutover area may be viewed primarily as a timber production objective. In most cases, however, re-establishment of trees is also very important for maintenance of wildlife habitat, watershed quality, and visual quality. That is, effective silviculture prescriptions not only meet timber production objectives but usually meet other natural resource management objectives as well.

Forest management objectives in British Columbia, as elsewhere in North America, are currently facing several challenges and undergoing substantial development to meet these challenges. Silviculturists are moving increasingly from even-aged, primarily clearcut systems to a greater range of silvicultural systems and greater demand for optimum timber production on fewer sites. To meet these challenges, it is increasingly important to recognize the capabilities and limitations of forest sites for meeting management objectives. It is also especially important to clearly recognize that success of a prescription is very dependent on the site to which it is applied. The BEC system is a valuable tool for assisting the silviculturist to assess site attributes and develop a prescription that best meets current management objectives.

Objectives and Scope

The principal objectives of this section are to summarize, for each site series:

- the ecologically adapted tree species and the principal **site-related** limitations to restocking a site with them to current standards (restocking method may be artificial or natural);
- the shrub and herbaceous vegetation that develops following clearcut tree harvesting; and
- current silviculture experience and ecological principles regarding practices to successfully meet timber management objectives.

Our intention in this section is to summarize basic operational experience and research information, which, along with management objectives and local experience, will assist a silviculturist to develop an ecologically sound silvicultural prescription. We do not recommend a single silvicultural system or practice as the best practice since this will vary depending on management objectives and local experience. However, the information contained here should help guide the selection of silviculture systems and practices. For the most part, the summary information is of a basic and general nature. We hope that it will be especially useful to the silviculturist who is developing a familiarity with an area, and that with increasing experience, silviculturists will add to or modify the considerations presented here.

We have not attempted to summarize practices for achieving non-timber objectives except as they are met by quickly reestablishing a stand of crop trees. We assume that silviculturists will refer to other available documents and sources of information for practices to meet non-timber objectives at both the stand and the landscape level.

The silviculture considerations summarized here consider regeneration in both clearcutting and partial harvesting silviculture systems for all site series. Outside of the IDF Zone, there is currently very little experience with regenerating partially harvested stands, either even-aged or uneven-aged. As a result, the silviculture considerations for partial harvesting systems, including site-limiting factors and expected results of regeneration practices, are tentative. We expect that they will be modified or enhanced as additional experience is gained, and we encourage input from silviculturists and others with experience in partial harvesting systems.

Partial harvesting systems including shelterwood, group selection, and single tree selection systems are being more widely encouraged and considered for a variety of ecosystems to meet both timber and non-timber sustainability.

The silviculture considerations in this section focus on coniferous tree species, with less attention to deciduous species. Although deciduous tree species that are adapted to the site are listed and some limiting site factors are identified, few comments on current practices for management of deciduous species are provided. There is relatively little experience managing for deciduous species on site units of this region.

Productivity (site index) estimates by site series have not been included in this guide since estimates more comprehensive than those that could be prepared for this guide are being prepared by the Site Productivity Working Group for all site series of British Columbia (see "Other Sources of Information – Productivity," below).

Silviculture consideration tables are presented for most of the principal biogeoclimatic units of the Cariboo Forest Region. However, tables are not presented for some units in which there is little experience in this region due to small extent or little silviculture history. For units that are primarily in other forest regions, the user is referred to site identification and interpretation guides for those regions.

Other Sources of Information

The information contained in this guide to site units is only one of many sources of information and guidance on silvicultural systems and practices. Although pertinent references are far too numerous to be adequately reviewed here, some relevant sources of information are cited.

General Lavender *et al.* (1990) ("Regenerating British Columbia's Forests") is an excellent general reference on the principles and methods of forest regeneration in British Columbia. Chapters by various authors describe: physiological and ecological principles of regeneration; principles of tree species selection and silvical characteristics of major tree species; reforestation planning; preharvest assessment and prescription; regeneration monitoring; natural regeneration; site preparation principles and methods (burning, mechanical and chemical); planting and seeding; control of competing vegetation; and insect, disease, and mammal damage.

Environmental and Soil Factors Affecting Regeneration The literature on site and soil factors affecting forest regeneration is large but the reader is referred to Lavender (1990), Stathers *et al.* (1990), and Klinka *et al.* (1990), all in "Regenerating British Columbia's Forests" for a summary of important site and soil factors affecting regeneration success. See Steen *et al.* (1990) for a guide to identification and management of summer frost-prone sites in the Cariboo Forest Region and Stathers (1989) for a summary of factors affecting frost occurrence and its effect on young forest plantations. Stathers and Spittlehouse (1990) summarize effects of soil temperature regime on seedling growth and techniques for modifying soil temperature regimes. Farnden (1994) summarizes environmental constraints to growth of crop trees in the ESSF Zone in British Columbia and practices to modify the seedling environment to encourage increased growth.

Productivity The Site Productivity Working Group has tabulated average site index information by site series for all biogeoclimatic units, site series, and species where information is currently available or can be reliably extrapolated from ecologically similar site series. A draft entitled "Average site index for select tree species and ecosystems in British Columbia: first approximation" was prepared in August 1996 and is expected to be released in published form early in 1998. This tabulation is a first approximation of average site index by site series and will be updated as additional information becomes available.

Tree Species Selection and Stocking Standards Tree species selection is a very important decision, which should be based on the silvical characteristics of the species and the ecological characteristics of the site. Literature on the silvical characteristics of species is large but the reader is referred to Klinka *et al* (1990) in "Regenerating British Columbia's Forests" for a summary of principles and current information on selected species. Tree species selection guidelines and stocking standards by site series are contained in the Forest Practices Code of B.C. guidebook entitled "Establishment to Free Growing Guidebook – Cariboo Forest Region" (B.C. Ministry of Forests and BC Environment 1995a). Although this guidebook does not include deciduous species, ecologically adapted deciduous species are listed for each site series in Silviculture Interpretations Working Group (1993). Stocking standards for uneven-aged Douglas-fir stands in the IDF are contained in Silviculture Interpretations Working Group (1992).

Site Preparation Guides The Forest Practices Code of B.C. Site Preparation Guidebook (B.C. Ministry of Forests and BC Environment 1995b) summarizes site preparation treatments and equipment and provides guidelines regarding the use of site preparation practices. Coates and Haeussler (1987) describe the types and uses of mechanical site preparation equipment. Burton (1992) provides a summary of site treatment options, including no treatment, and the advantages and disadvantages of each for specific objectives. Treatment options discussed include prescribed burning, no site preparation, harvest modifications, herbicides, grazing, grass seeding, mulches, and a variety of mechanical treatment options. Principles and methods of drag scarification for natural lodgepole pine regeneration are described by Bancroft (1996) ("Fundamentals of natural lodgepole pine regeneration and drag scarification"). Procedures for documenting and evaluating the effects of broadcast burning are presented in Trowbridge *et al*. (1986).

Insects and Diseases Principal damaging insects and diseases of managed forests in British Columbia are described with photographs in Finck *et al*. (1992). Common tree diseases of British Columbia are described with photographs by Allen *et al*. (1996). Finck *et al*. (1990) describe damage potentials and signs and symptoms of insect pests in regenerating British Columbia forests.

Vegetation Management Comeau *et al*. (1996) include several papers by various authors on vegetation management. Topics include silvicultural systems for vegetation control, prescribed fire, mechanical treatments, chemical treatments, seeded cover crops, mulching, sheep, forest rangelands, and biodiversity. Vegetation complexes in British Columbia and some management considerations for them are described by Newton and Comeau (1990) and B.C. Forest Practices Branch (1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g). Thompson and Steen (1996) and Steen and Smith (1991) discuss the use of seeded cover crops, and Newsome (1996) discusses the use of sheep for vegetation management. Coates *et al*. (1990) summarize the effects of treatments on selected shrub and herbaceous species, and Haeussler *et al*. (1990) summarize the autecology of selected common shrubs and herbs in British Columbia. Otchere-Boateng and Ackerman (1990) describe vegetation control equipment including manual clearing tools, manual girdling tools, ground spraying equipment, stem injection tools, and aerial spraying equipment.

Silvicultural Systems The Forest Practices Code of British Columbia Silvicultural Systems Guidebook (B.C. Ministry of Forests and BC Environment 1995c) describes basic concepts and terminology of silvicultural systems used in British Columbia and presents guidelines for choosing a silvicultural system. Guidelines for management of uneven-aged Douglas-fir stands in the IDF are contained in Silviculture Interpretations Working Group (1992).

Soil Erosion and Soil Compaction Hazards Timber harvesting strategies for reducing the risk of excessive site degradation are presented in Lewis *et al*. (1989). This field guide insert includes keys for assessing compaction hazard, displacement hazard, surface erosion hazard, and mass wasting hazard. Background information for these keys is presented in Carr *et al.* (1991) and Lewis and Timber Harvesting Subcommittee (1991).

Silviculture Practices to Maintain Biodiversity and Wildlife Habitat Guidelines and literature on silviculture practices for biodiversity conservation are rapidly increasing in number. Basic principles of managing forests for biodiversity conservation are presented in Hunter (1990) and Hansen *et al*. (1991). The Forest Practices Code of B.C. Biodiversity Guidebook (B.C. Ministry of Forests and BC Environment 1995d) presents guidelines for landscape- and stand-level biodiversity, including wildlife tree patches. The Managing Identified Wildlife Guidebook[1] provides recommendations for forest practices on identified wildlife species habitats. Park and McCulloch (1993) present guidelines for juvenile spacing to maintain biodiversity. Guidelines for logging on mule deer winter ranges in the Cariboo Forest Region are contained in Armleder *et al*. (1986).

Use of the Silviculture Considerations Tables

The silviculture considerations tables presented in the following sections contain information for each forested site series within a biogeoclimatic unit on the following topics:

- ecologically adapted tree species;
- principal site factors limiting establishment and early growth of tree species;
- potential shrub and herbaceous vegetation; and
- silviculture practices that have been successful or are expected to be successful in meeting regeneration objectives for timber management.

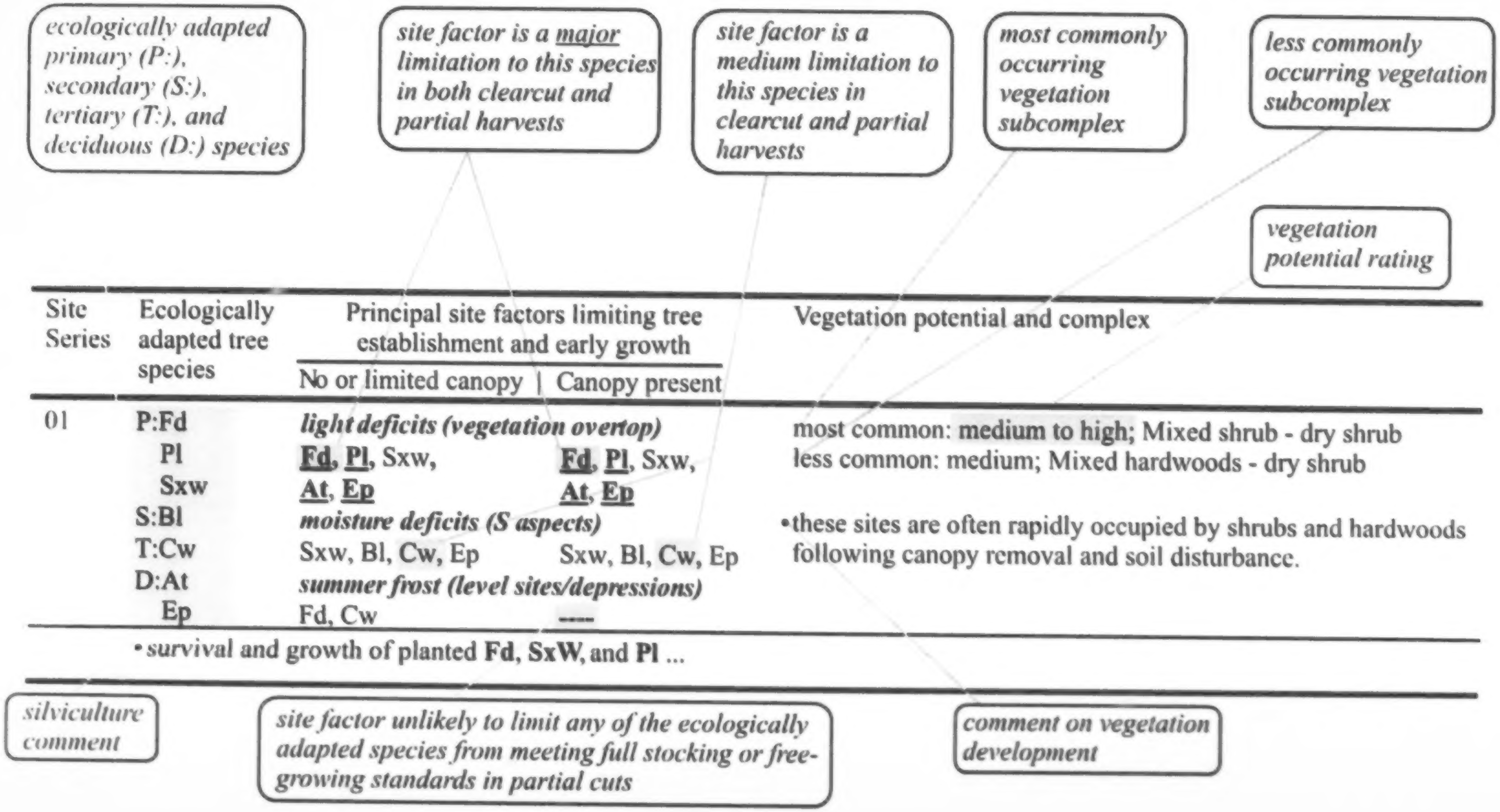
---

[1] B.C. Ministry of Forests and BC Environment. 1996. Forest Practices Code of British Columbia, managing identified wildlife guidebook, B.C. Min For. and BC Environ., Victoria, B.C. Unpublished internal government review draft.

The intent of these tables is to provide basic interpretations and principles that a silviculturist can use to develop a silviculture prescription for a site. The tables do not state a preferred or best management practice since this may vary with the objectives for the site as well as the specific attributes of the site. The set of tables for each of the biogeoclimatic units is preceded by comments on general silviculture practices and constraints within the biogeoclimatic unit as a whole. This general section also lists some insects and diseases of most concern to silviculturists. The following comments provide further description of the contents of the tables and guidance for their use. An example table and guidance for its use is presented on the following page.

Ecologically Adapted Species The ecologically adapted species for each site series listed in this column are the same as those listed in the "Establishment to Free Growing Guidebook: Cariboo Forest Region" (B.C. Ministry of Forests and BC Environment 1995a) except for deciduous species. The list of ecologically adapted deciduous species is the same as that in Silviculture Interpretations Working Group (1993). The list is ordered by primary species (P:), secondary species (S:), tertiary species (T:), and deciduous species (D:). These classes are defined in the above guidelines. The order of species within each of the classes has no particular meaning and should not be considered relevant to species selection. Tree species are listed by the following codes: **At** (trembling aspen), **Act** (cottonwood), **Bl** (subalpine fir), **Cw** (western redcedar), **Ep** (paper birch), **Fd** (Douglas-fir), **Hw** (western hemlock), **Pl** (lodgepole pine), **Pa** (whitebark pine), **Py** (ponderosa pine), **Sb** (black spruce), **Se** (Engelmann spruce), **Sw** (white spruce), and **Sxw** (hybrid white spruce).

Principal Site Factors Limiting Tree Establishment and Early Growth This column lists the principal site factors that should be considered in developing a silviculture prescription for a site, and rates the impact of the factor on each of the ecologically adapted species. The list and the rating apply where the site has received no silvicultural or other treatment other than timber harvesting to prepare it for regeneration. The species listed under each site factor indicate those species that are most limited by that factor. Species that are bolded and underlined are considered most limited. Unless the limiting factor is ameliorated, plantations of these species are considered likely to fail to meet free-growing standards on most sites in most years. Natural regeneration ingress rates will generally be inadequate to restock most sites. Species


ecologically adapted primary (P:), secondary (S:), tertiary (T:), and deciduous (D:) species
site factor is a major limitation to this species in both clearcut and partial harvests
site factor is a medium limitation to this species in clearcut and partial harvests
most commonly occurring vegetation subcomplex
less commonly occurring vegetation subcomplex
vegetation potential rating
silviculture comment
site factor unlikely to limit any of the ecologically adapted species from meeting full stocking or free-growing standards in partial cuts
comment on vegetation development

Site Series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***light deficits (vegetation overtop)***		most common: medium to high; Mixed shrub - dry shrub
	Pl	**Fd**, **Pl**, Sxw,	**Fd**, **Pl**, Sxw,	less common: medium; Mixed hardwoods - dry shrub
	Sxw	**At**, **Ep**	**At**, **Ep**	
	S:Bl	***moisture deficits (S aspects)***		•these sites are often rapidly occupied by shrubs and hardwoods following canopy removal and soil disturbance.
	T:Cw	Sxw, Bl, Cw, Ep	Sxw, Bl, Cw, Ep	
	D:At	***summer frost (level sites/depressions)***		
	Ep	Fd, Cw	----	

•*survival and growth of planted* **Fd**, **SxW**, and **Pl** ...

FIGURE 4 Example silviculture considerations table.

that are listed but not bolded and underlined are less limited. Unless the limiting factor is ameliorated, plantations of these species are considered likely to fail to meet free-growing standards on all sites in most years. Many sites planted with these species will require at least fill planting and, in some years or on some sites, high percent mortality or failure to meet free-growing standards is considered likely. Species that are not listed are least limited. They are considered likely to meet free-growing standards on most sites in most years without amelioration of the limiting factor but growth will likely be enhanced by amelioration of the listed factor.

Limiting site factors are considered separately for clearcut or low retention partial harvest ("no or limited canopy") and for higher retention partial harvest ("canopy present"). Since a wide variety of silvicultural systems using partial harvesting are potentially available, it is necessary to identify the type of partial harvesting to which the limiting factors apply. For purposes of these tables, the identified partial harvest silvicultural system is one that we currently consider very likely to be operationally implemented on the particular site series. This "very likely to be implemented" silvicultural system varies by biogeoclimatic unit, and by site series within the biogeoclimatic unit. They are identified on the first page of each biogeoclimatic unit section under "Silviculture Considerations Table – Harvest Assumptions." If a different silvicultural system is used than the one listed, the limiting factors may no longer apply.

The list of limiting factors and the ratings of species under each of them are based on field observations, autecology of the species related to attributes of each site series, limited research results, and experience of operational silviculturists. In many cases the ratings are only our best estimates, based on very little information. This is especially true for ratings under the "canopy present" or partial harvesting scenario, since there is very little silviculture experience or research in partial harvesting systems in most biogeoclimatic units. It is also especially true for deciduous species, since there is little experience in managing for these species in this area. As additional experience is gained, we anticipate that the list of limiting factors and the species ratings under each of the factors will be modified.

Limiting factors in the tables are often followed by parentheses, which further refine the site conditions where the limiting factor applies. For example "cold, wet soils (toe slopes)" indicates that cold, wet soils are a significant limiting factor where the site series occurs on toe slope positions but not necessarily throughout the distribution of the site series. The species ratings under the limiting factor apply only to the specified site conditions.

The following is a brief description of each of the limiting site factors listed in the tables.

Moisture deficits in the tree seedling are affected by available moisture content in the soil, rate of water uptake by the roots and movement throughout the plant, and moisture loss from the leaves and other tissues. For purposes of these tables, moisture deficit is applied to site series where moisture stress causing mortality or insufficient growth to particular tree species is likely to result from dry soils or high rates of moisture loss from the leaves. Tree species ratings are based on silvics literature and field observations regarding the distribution of tree species along moisture gradients.

Light deficits (vegetation overtop) refer to shade created by overtopping vegetation. Under a clearcutting system, light deficits are due primarily to shade created by overtopping shrubs and herbs. The light limitation can be ameliorated by removal or reduction in the cover of vegetation around the seedling and by appropriate species selection. In partial harvesting systems, light deficits may be due to a combination of shade from residual trees as well as from shrubs and herbs. In this situation, the limitation can be ameliorated by reducing shrubs and herbs around the seedling and by careful microsite selection when planting to maximize exposure to light coming through the residual tree canopy.

Nutrient deficits, especially nitrogen, may limit tree growth to some extent on a majority of sites. For purposes of these tables, however, nutrient deficits are listed for those site series where nutrients are especially limiting due to low ability of soils to hold nutrients. These are sites with coarse sandy soils or with very shallow soils. In most cases, no species are listed under nutrient deficits since these deficits are not likely to preclude restocking unless soil organic matter or surface soils are removed from the site or planting spot. Special attention should be given to conservation of soil organic layers and both coarse and fine woody debris on sites where nutrient deficits are identified.

Cold, wet soils have a near-surface water table and typically a relatively thick organic layer over the mineral soils. They are found primarily on toe slope positions and in depressions. Due to the temperature-buffering capacity of water and the insulative properties of wet soil organic layers, these soils remain cool during the growing season. On some sites, temperatures may seldom rise above 5–7°C. Root growth of tree seedlings as well as water and nutrient uptake by roots at these low temperatures is limited by slow metabolic rates. Slow root growth generally results in slow shoot growth. Limitations of cold, wet soils can be ameliorated by planting on raised, better-drained microsites. These microsites may be either natural or artificial.

Cold, moist soils are similar to cold, wet soils but are not as wet. They are primarily soils moistened by seepage in cold or cool climates. Root growth and water and nutrient uptake are limited by cool soils but limitations are generally less severe than for cold, wet soils.

Cold soils limitation is similar to cold, wet and to cold, moist soils but soils may be wet or moist for only a small part of the growing season, primarily early in the growing season. They are typically found in cold air accumulation areas with fine-textured or compacted soils. Limitations are generally less severe than for cold, wet soils.

Summer frost (subzero air temperatures or plant tissue temperatures during the growing season) can cause lethal or non-lethal damage to conifer seedlings. Nonlethal damage may affect metabolic processes such as photosynthesis, which affect growth and may increase susceptibility to pathogens. Lethal damage may include only a single needle, a bud, or the entire plant. Tree species differ in their growing season sensitivity to subfreezing temperatures. Sensitive species are Douglas-fir, western redcedar, and western hemlock. Moderately resistant species are hybrid white and Engelmann spruce and subalpine fir. Lodgepole pine and black spruce are relatively tolerant of summer frost. Subzero air temperatures arise from two different processes (Stathers 1989; Steen *et al.* 1990). Radiation frost results when the surface of the soil or a plant cools by radiating heat toward the atmosphere. On calm, clear nights, radiation cooling may cool the soil surface to temperatures below 0°C even though air temperatures above the surface are warmer. The second process is local advection frost, which occurs when air that has cooled by radiation cooling at another location flows onto a site.

Since cold air is more dense than warm air, it tends to flow downhill and pond in depressions as well as against barriers to its movement. Advection frost may be especially common in areas with a large upslope source area where the surface is cooled by radiation cooling.

Winter dessication occurs when moisture loss from leaves cannot be balanced by moisture uptake through the roots due to frozen or very cold winter soils and slow water movement through the plant. Potentials are probably greatest on steep, warm aspects with a shallow to moderate snowpack and frozen soils. Although winter dessication may occur widely on a few seedlings, it is included only where risks are highest for a large number of seedlings.

Rooting restrictions apply to areas of near-surface bedrock where root growth is limited by the small potential rooting volume. Limited root growth may result in mortality or growth losses due to desiccation, nutrient deficits, stem toppling, or other factors.

Snowpress may cause widespread damage to young tree seedlings, especially in plantations. However, it has been listed as a limiting factor only for site series where hazards are greatest. These are generally in snowy climates and sites with the greatest spring snowpack. Several related processes have been combined under snowpress. The most common is where the weight of the melting snowpack presses leafy herbaceous plants downward onto the tree seedling, causing the seedling to be pressed to the ground under a mat of vegetation. In some cases, the melting snowpack may itself damage the seedling by breaking or tearing lateral branches from the shoot, especially if the snowpack has an icy layer on the surface as often occurs in clearcuts. Another process that has been included here is often called snowcreep damage, which results when the snowpack slides very slowly downhill and presses tree seedlings to the ground in the downslope direction either directly or indirectly by pressing vegetation onto the seedling. Seedlings planted on the downhill side of barriers such as stumps are less affected by snowcreep, although research indicates that seedlings planted behind stumps may become etiolated. The effects of snowpress damage can be at least partially ameliorated by removing overtopping herbaceous vegetation from around the tree seedling and by planting species and stock types relatively resistant to snowpress. Small-diameter lodgepole pine stock is especially susceptible to snowpress.

High surface temperatures are potentially limiting to regeneration on steep south and west aspects in warm climates. High surface temperatures can result in lethally high temperatures in the cambial layer and inner bark of a young seedling. Although this limitation is likely not common in the central Interior of British Columbia, it may cause limited mortality and some growth reductions on some hot slopes, especially if they are blackened by burning.

Vegetation Potential and Complex This column rates the shrub and herbaceous vegetation potential and lists the vegetation complexes that develop following clearcut harvesting on each site series. Some comments regarding vegetation development and competition with tree seedlings are also provided. Vegetation potential is an index of the relative amount of vegetation biomass present in the low shrub and herbaceous layers within approximately 5 years after disturbance. Three classes are defined (Table 16).

TABLE 16 Vegetation potential classes

Class	Description
Low	Shrub and herb biomass develops relatively slowly and is relatively small 5 years following disturbance; vegetation >25 cm tall typically covers 20% or less of soil surface, and leafy biomass is very sparse at heights above 50 cm.
Medium	Shrub and herb biomass develops moderately quickly and is moderately large at 5 years after disturbance; shrub and herb vegetation >25 cm tall typically covers 20–75% of surface within 5 years but is typically dominated by one or two vegetation layers such as low shrubs and low herbs; leafy biomass is common but not abundant and does not form nearly continuous canopy.
High	Shrub and herb biomass develops quickly and is relatively large 5 years following disturbance; shrub and herbaceous vegetation >25 cm tall typically covers >75% of soil surface within 5 years and includes several overlapping layers such as low herbs, medium herbs, tall herbs, and low shrubs; leafy biomass is abundant and forms nearly continuous canopy at heights over 50 cm.

Nine of the vegetation complexes defined by Newton and Comeau (1990) have been recognized as present and frequently dominating timber-harvested openings in the Cariboo Forest Region: Dry alder, Dry shrub, Ericaceous shrub, Fern, Fireweed, Mixed hardwood, Mixed shrub, Pinegrass, and Subalpine herb. Some others such as the Wet alder complex are also present but generally do not dominate harvested openings. The nine vegetation complexes have been further subdivided for purposes of this field guide into a total of 31 vegetation subcomplexes based on variations in species composition and structural development. These subcomplexes are identified and described in Appendix 15.

Silviculture Comments The single column of comments completing each site series section in the table summarizes management considerations and current experience relevant to tree species selection, site-limiting factors, and silviculture practices to ameliorate the site-limiting factors. The term "restocked" (or "to restock") in these comments generally means that the site is sufficiently stocked (sufficient density, spacing, and growth of preferred and acceptable species) to meet current free-growing standards. Silviculture comments are included for artificial and natural regeneration in clearcut and partial cutting systems for most primary and secondary and some tertiary conifer species. The comments generally do not address management for deciduous species due to lack of experience in managing for these species.

The comments section addresses only two long-term productivity issues: 1) retention of soil organic layers and woody debris and 2) soil compaction, rutting, and puddling. Retention of woody debris, both coarse and fine woody debris, is important to long-term productivity, regeneration, and biodiversity on all sites. However, comments have been made only on those site series where the need to retain woody debris is considered especially important. Similarly comments are applied only where compaction and rutting hazards are generally high.

It must be clearly understood that these comments do not replace good on-site judgement and critical decision-making that considers management objectives and all attributes of the specific site. They are simply general principles and summaries of current experience that should be considered in the context of other factors when developing a silviculture prescription for a site. They are not site prescriptions. In most cases, there are several ways to address limiting factors and practices and, in some cases, practices other than those described here may be most suitable for a specific site. Practices that are described as having been successful may not be successful on all sites, especially on those that are atypical members of the site series. Comments regarding regeneration of partially cut stands are especially tentative due to lack of extensive experience in most biogeoclimatic subzones.

Pagination The Silviculture Considerations section is page numbered similar to the Site Units section (Section 6). The page number includes the section number (7), subsection number (1–41), and page number within the subsection. Each biogeoclimatic unit in Section 7 has the same subsection number as in Section 6. Some subsection numbers are currently missing since silviculture considerations have not been prepared for the corresponding biogeoclimatic unit. Subsequent additions to this guide will include some of these units.

ESSFwc3 Silviculture Considerations

Silviculture Practices and Options

- ***Predominant silviculture system*** in the ESSFwc3 is currently even-aged (clearcutting) management with artificial regeneration (prompt planting of spruce) following prescribed burning or mechanical site preparation (predominantly scarification or mounding) to control competing vegetation.

- ***Partial harvest systems*** experience is very limited; early research results (pre–free growing) indicate that .03 and .13 ha clearings in a group selection system can likely be regenerated by planting Se and Bl but growth is slow; single tree selection systems would likely be less successful due to lower survival and growth of planted stock and the generally low quality of advance regeneration.

- ***Advance regeneration*** is predominantly Bl. Advance Bl and Se regeneration <25 cm tall is generally of good form and vigour, and generally responds to canopy opening by increased height growth; taller Bl stems are often quite old and damaged, and have incipient decay.

- ***Natural restocking*** of sites with Bl and Se within accepted regeneration delay period requires abundant seed on exposed mineral soil or mixed mineral/organic soil; seed abundance and quality generally are not reliable from year to year and may decline significantly with higher elevation; most seed falls within two tree lengths of the mature stand edge.

- ***Lodgepole pine regeneration*** in the ESSFwc3 is limited by snowpress and snowcreep damage. Competing vegetation significantly affects early survival and growth of lodgepole pine, but, due to rapid initial growth, lodgepole pine can grow relatively quickly above competing vegetation.

Principal Insect and Disease Concerns

Heart rots are less frequent and less damaging to subalpine fir in the ESSFwc3 than in most other biogeoclimatic units; dominant and codominant subalpine fir stems are often sound.
Tomentosus root rot causes reduced vigour and death of spruce and subalpine fir.
Risk of spruce beetle is moderate to high and can have locally high

impacts, especially in areas with abundant windthrow or poor logging. Two-year-cycle budworm could have severe impacts on regeneration in partial harvest systems.
Impacts of white pine weevil (spruce weevil) are probably minimized by high elevations.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger (generally >60 m wide) group selection systems.

Canopy present refers primarily to group selection systems with small to moderate-size (25–60 m wide) harvested groups.

ESSFwc3 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Bl	***summer frosts***		medium; Ericaceous shrubs - rhododendron.
	Se	Bl, Se	Bl, Se	
	S:Pl	***light deficits (vegetation overtop)***		•dense white-flowered rhododendron changes little following canopy removal but recovers slowly after clearing or damage to above-ground stems;
		Bl, **Se**, **Pl**	Bl, **Se**, **Pl**	
		cold soils		
		Bl, Se, Pl	Bl, Se, Pl	•cover of herb layer often increases dramatically following reduction in shrub cover.
		snowpress/creep		
		Bl, Se, **Pl**	Bl, Se, **Pl**	

- •survival and growth of planted **Se** generally adequate to restock site if vegetation controlled at planting spot; growth of seedlings best if planted on raised microsites or exposed mineral soil; snowcreep damage least on raised microsites and downslope of barriers; seedlings on shady side of stump may become etiolated;
- •medium-intensity broadcast burn will reduce above-ground competing vegetation for 2–4 years and warm soils;
- •frost damage greatest on gentle lower and toe slope positions with no forest canopy;
- •use of **Pl** limited by its low shade tolerance and susceptibility to snowpress and snowcreep;
- •advance **Bl** and **Se** regeneration <25 cm tall may contribute significantly to crop tree stocking; taller stems often have poor form and incipient decay; advance **Bl** regeneration often originates by layering;
- •natural restocking by **Bl** and **Se** requires abundant seed on exposed mineral soil or mixed mineral/organic soil; seed production not predictable from year to year and may decline significantly with increasing elevation.

ESSFwc3 Site Series - Silviculture Considerations(continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Bl Se Pl	***moisture deficits***		low to medium; Ericaceous shrub - rhododendron •dense white-flowered rhododendron cover changes little following canopy removal but recovers slowly after clearing or damage of above-ground stems.
		Bl, Se	Se	
		cold soils		
		Bl, Se	Bl, Se, Pl	
		light deficits		
		Pl	Se, **Pl**	
		snowpress/creep		
		Pl	**Pl**	
	•survival and growth of planted **Bl**, **Se,** and **Pl** generally adequate to restock site if vegetation controlled at planting spot and seedlings planted on exposed mineral soil, downslope of barriers to snowcreep; short, large-diameter plugs best; •**Bl** and **Se** growth on these sites generally slow; limited by dryness, short cool growing season, and shallow soils; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
03	P:Bl Se	***summer frost***		low - medium; Subalpine herb •vegetation increases following canopy opening but is limited by cold, wet soils; soils warmed by removal of organic layer or by drainage may develop dense herbaceous vegetation.
		Bl, **Se**	**Bl**, **Se**	
		light deficit (vegetation overtop)		
		Bl, **Se**	**Bl**, **Se**	
		cold, wet soils		
		Bl, **Se**	**Bl**, **Se**	
		snowpress/creep		
		Bl, **Se**	Bl, Se	
	•survival and growth of planted **Bl** and **Se** generally poor; may be somewhat improved on raised microsites (natural or artificial); •trees with large dense crowns exposed to winds by logging generally very susceptible to windthrow; •sites very susceptible to soil rutting and compaction.			

ESSFwk1 Silviculture Considerations

Silviculture Practices and Options

- ***Predominant silviculture system*** in the ESSFwk1 is currently even-aged management (clearcutting) with artificial regeneration following prescribed burning or mechanical site preparation (predominantly scarification or mounding) to control competing vegetation. Prompt planting following site preparation is generally essential to achieve free-growing plantations.

- ***Partial harvest systems*** experience is very limited. Selective harvesting of dominant spruce and retention of smaller stems without site preparation resulted in inadequate stand regeneration following logging. Early research results suggest that Se and Bl plantations can be successfully established in group selection openings (0.03 and 0.13 ha).

- ***Advance regeneration*** is predominantly Bl. Advance Bl regeneration >25 cm tall is often old and of poor form and vigour, and has incipient decay; younger Bl advance regeneration (and post-harvest ingress) may contribute to second-growth stand of sound crop trees.

- ***Natural restocking*** of sites with Bl and Se within accepted regeneration delay period requires exposed mineral soil or mixed mineral/organic soil in year of good cone crop. Natural seed abundance and seed quality are generally not reliable from year to year and may decline at higher elevations; most seed falls within two tree lengths of the mature stand edge.

Principal Insect and Disease Concerns

Subalpine fir heart rots are less frequent and damaging in the ESSFwk1 than in most lower-elevation biogeoclimatic units.
Tomentosus root rot causes reduced growth and some mortality of spruce and subalpine fir.
Risk of spruce beetle is moderate and can have locally high impacts, especially in areas with abundant windthrow or poor logging.
Two-year-cycle budworm could have severe impacts on regeneration in partial harvest systems.
Impacts of white pine weevil (spruce weevil) are probably minimized by high elevations.
Plantations have a moderate risk of damage from snowshoe hare, especially where vegetation cover is present.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >60 m wide harvested groups) selection systems;

Canopy present refers to group selection systems with small to moderate-size (generally 30–60 m wide) harvested groups; does not include canopy resulting from low-volume single tree selection systems except on wet spruce site units (/06 and /07).

ESSFwk1 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Bl	***summer frost (level sites)***		medium; Mixed shrub - moist forb
	Se	Bl, Se	----	
	S:Pl	***light deficits (vegetation overtop)***		•non-ericaceous shrub and herbaceous growth increases dramatically following logging especially on north aspects and where forest floor is disturbed by logging; •fireweed, grasses, and a variety of forbs can completely dominate burned sites within 3 years, especially on north aspects; generally less abundant and shorter on south aspects.
		Bl, **Se**, **Pl**	Bl, **Se**, **Pl**	
		snowpress		
		Se, **Pl**	Pl	
		cold soils		
		----	Bl, Se	

•survival and growth of planted **Se** and **Bl** generally adequate to restock clearcut site if overtopping vegetation controlled at planting spot and seedlings are planted in mineral or well-decomposed organic soil;

•advance **Bl** regeneration >25 cm tall frequently has poor form, branch damage, and incipient decay; shorter stems may contribute significantly to crop tree restocking;

•little experience with planting **Bl** in this area but survival and growth expected to be high;

•**Pl** plantation success limited by low shade tolerance and susceptibility to snow damage;

•snowpress is most damaging where tall, dense grasses or other tall herbaceous plants are abundant;

•**Pl** branches may be damaged by snow breakage, especially on north and east aspects;

•moderate-intensity broadcast burn will reduce vegetation cover for 3–5 years and allow warming of soil for 2–3 years;

•herbicide treatments reduce above-ground vegetation but generally have less effect on soil warming;

•risk of surface erosion often high on moderate to steep slopes where forest floor is removed; spring runoff volumes often high.

ESSFwk1 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>02</td><td>P:Bl
Pl
Se</td><td><i>moisture deficits</i>
Bl, Se
<i>light deficits</i>

<i>nutrient deficits</i>
<i>rooting restrictions</i></td><td>Se
Pl</td><td>low to medium; Ericaceous shrub - rhododendron</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Pl usually adequate to restock site if planted on deep soil and in >50% full sun;
•site productivity for Bl and Se relatively low; survival of planted Bl and Se generally moderate;
•soils usually thin and rubbly; maintaining surface organic layers and woody debris important for long-term site productivity.</td></tr>
<tr><td>03</td><td>P:Pl
Se
S:Bl</td><td><i>light deficits (vegetation overtop)</i>
Pl, Se, Bl
<i>snowpress</i>
Pl, Se</td><td>Pl, Se, Bl
Pl, Se</td><td>medium to high; Ericaceous shrub - rhododendron
•white-flowered rhododendron typically very dense and not significantly affected by canopy removal;
•burning reduces rhododendron cover for several years.</td></tr>
<tr><td></td><td colspan="4">•survival and early growth of planted Se and Pl usually sufficient to restock site if vegetation reduced at planting site;
•dense white-flowered rhododendron limits plantation survival and early growth by shading and snowpress;
•mounding or medium-intensity broadcast burn effectively reduces rhododendron cover; regrowth of rhododendron is relatively slow following mechanical damage or burning; vegetation redevelopment primarily fireweed and low forbs with incomplete cover;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

Silviculture Considerations for ESSFwk1 Site Series (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth: No or limited canopy	Principal site factors limiting tree establishment and early growth: Canopy present	Vegetation potential and complex
04	P:Bl Se S:Pl	***light deficits (vegetation overtop)*** **Bl**, **Se**, **Pl**	**Bl**, **Se**, **Pl**	high; Mixed shrub - moist shrub •shrub and tall forb cover increases dramatically following canopy opening and completely dominates site within 3–4 years; •mineral soil exposure increases risk of site being dominated by pioneer species including Sitka alder, fireweed, grasses, and sedges.
		summer frost (gentle slopes) **Bl**, **Se**	Bl, Se	
		snowpress Se, **Pl**	Se, **Pl**	
		cold, wet soils Bl, Se, Pl	Bl, Se, Pl	
	•survival and growth of planted **Bl**, **Se**, and **Pl** generally adequate to restock site if planted on raised microsites or exposed mineral soil and if vegetation is controlled at planting spot; vegetation control requirements greatest for planted **Pl**; •advance **Bl** regeneration >25 cm tall frequently has poor form, branch damage, and incipient decay; •risk of frost damage to **Se** and **Bl** reduced on slopes >15% gradient; •soils very susceptible to rutting and compaction when not frozen.			
05	P:Bl Se S:Pl	***light deficits (vegetation overtop)*** **Bl**, **Se**, **Pl**	**Bl**, **Se**, **Pl**	high; Mixed shrub - tall fern •devil's club cover decreases dramatically following canopy removal and is quickly replaced by other shrubs and tall herbs; •mineral soil exposure increases risk of site being dominated by Sitka alder, fireweed, grasses, and sedges.
		snowpress Se, **Pl**	Se, **Pl**	
		cold, wet soils		
	•survival and growth of planted **Bl**, **Se**, and **Pl** generally adequate to restock site if planted on raised microsites or exposed mineral soil, and if vegetation is controlled at planting spot; vegetation control requirements greatest for planted **Pl**; •advance **Bl** regeneration >25 cm tall frequently has poor form, branch damage, and incipient decay; •soils susceptible to rutting and compaction; surface erosion hazard generally moderate to high.			

Silviculture Considerations for ESSFwk1 Site Series (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Bl Se	***light deficits (vegetation overtop)***		medium; Mixed shrub - wet forb
		Bl, Se	**Bl**, **Se**	
		cold, wet soils		•shrub and herbaceous vegetation increases little following canopy removal; limited by cold wet soils and deep organic layers.
		Bl, **Se**	**Bl**, **Se**	
		summer frost		
		Bl, **Se**	**Bl**, **Se**	
	•low-productivity sites for timber due to cold wet soils and frequent frost; difficult to regenerate; •survival and early growth of planted tree species (all species) poor except on raised microsites (natural or artificial); •high risk of summer frost damage to planted **Se** and **Bl**; may be reduced slightly by maintaining partial tree/shrub canopy but effects generally overwhelmed by inflow of cold air if large upslope cold air source present; •advance **Bl** regeneration >25 cm tall frequently has poor form, branch damage, and incipient decay; •soil rutting and compaction risks are high when soils not frozen; •windthrow risk high for trees with large dense crowns exposed to winds by logging, especially if preharvest canopy closed.			
07	P:Bl Se	***cold, wet soils***		medium to high; Mixed shrub - wet forb
		Bl, **Se**	**Bl**, **Se**	
		light deficits (vegetation overtop):		•cover of alders, black twinberry, ferns, and grasses increases following canopy removal.
		Bl, Se	Bl, Se	
		summer frost		
		Bl, **Se**	**Bl**, **Se**	
	•(same as /06)			

ESSFxv1 Silviculture Considerations

Silviculture Practices and Options

Very little timber harvesting has been conducted to date and there is very little silviculture experience in the ESSFxv1. Consequently, the silviculture considerations presented here are less complete and more tentative than those presented for other biogeoclimatic units. In general, silviculture systems and regeneration constraints are similar to those of the MSxv except that growing seasons are shorter, frost is likely more frequent, and soils are generally colder. The ESSFxv1 is probably the least productive area for timber production, outside of the BG and AT zones, in the Cariboo Forest Region.

Predominant silviculture system for the very small number of currently harvested sites in the ESSFxv1 is even-aged management (clearcutting). Mesic and drier sites have been managed primarily for lodgepole pine and most have been planted with pine rather than relying on natural regeneration. Wetter sites have been planted with spruce or pine–spruce mixtures on screefed or scarified patches.

Partial harvest systems experience in the ESSFxv1 is non-existent, although a research trial in the MSxv at lower elevations indicates that openings 30 m or more wide in lodgepole pine stands may be restocked naturally with lodgepole pine natural regeneration ingress.

Advance regeneration on mesic sites in the ESSFxv1 ranges from sparse to moderate density and is primarily subalpine fir with some spruce. Growth of subalpine fir in the ESSFxv1 is very slow.

Principal Insect, Disease, and Abiotic Damage Concerns

There are relatively few insect and disease concerns in the ESSFxv1. The incidence and severity of mountain pine beetle attacks, dwarf mistletoe, and rusts are much less than in the SBPS. Abiotic damage, especially summer frost effects, are generally of greatest concern.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger (generally >60 m wide between mature timber edges) group selection systems;

Canopy present refers primarily to group selection systems with small and moderate-size (generally 25–60 m wide) groups; does not include canopy resulting from low-volume single tree selection systems except on wet spruce sites (site series /08 and /09).

ESSFxv1 Site Series - Silviculture Considerations

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>01</td><td>P:Pl</td><td><i>moisture deficits</i></td><td></td><td>low: Dry shrub - dwarf ericaceous shrub</td></tr>
<tr><td></td><td>Se</td><td>Se, Bl</td><td>----</td><td></td></tr>
<tr><td></td><td>Bl</td><td><i>summer frost (gentle slopes)</i></td><td></td><td>•cover of low forbs and grasses increases somewhat following canopy opening.</td></tr>
<tr><td></td><td>S:Pa</td><td>Pl, Se, Bl, Pa</td><td>Se, Bl</td><td></td></tr>
<tr><td></td><td></td><td><i>light deficits (vegetation overtop)</i></td><td></td><td></td></tr>
<tr><td></td><td></td><td>----</td><td>Pl, Pa</td><td></td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration expected to be adequate to restock cleared sites if sufficient numbers of cones present and well distributed; although scarification likely not required for seedbed management, regeneration period will likely be shortened by drag scarification conducted very soon after logging;
•survival and growth of planted Pl expected to be adequate to restock cleared and partial-cut sites if planted in sunny / lightly shaded microsites;
•frost damage to Se and Bl may be reduced if planted with Pl in Pl-dominated mixtures;
•frost damage to all species may be reduced by planting on exposed mineral soil;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>02</td><td>P:Pl</td><td><i>moisture deficits</i></td><td></td><td>low: Dry shrub - dwarf ericaceous shrub</td></tr>
<tr><td></td><td>Pa</td><td>Pl, Pa, Bl</td><td>Pl, Pa, Bl</td><td></td></tr>
<tr><td></td><td>T:Bl</td><td><i>winter dessication</i></td><td></td><td>•cover of low forbs and grasses increases little following canopy opening.</td></tr>
<tr><td></td><td></td><td>Pl, Pa, Bl</td><td>Pl, Pa, Bl</td><td></td></tr>
<tr><td></td><td></td><td><i>rooting restrictions (bedrock)</i></td><td></td><td></td></tr>
<tr><td></td><td></td><td><i>nutrient deficits</i></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">•very low productivity for trees and extremely difficult to restock;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

ESSFxv1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting trree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Pl	***moisture deficits***		low: Dry shrub - dwarf ericaceous shrub
	S:Pa	Pl, Pa	Pl, Pa	
		summer frost		•shrub and herbaceous vegetation increases little following canopy opening.
		Pl, Pa	----	
		nutrient deficits		
	•**Pl** natural regeneration expected to be adequate to restock cleared sites if sufficient numbers of cones present and well distributed; although scarification likely not required for seedbed management, regeneration period will likely be shortened by drag scarification conducted very soon after logging; •insufficient experience to predict **Pa** natural ingress or advance regeneration release; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
04	P:Pl	***moisture deficits***		low: Dry shrub - dwarf ericaceous shrub
	Pa	Pl, Pa, **Bl**, **Se**	Pl, Pa, **Bl**, **Se**	
	T:Bl	***winter dessication***		
	Se	all species	all species	
		light deficits		
		----	Pl, Pa	
	•growth of **Bl** and **Se** poor due to moisture deficits; •**Pl** natural regeneration likely adequate to restock sites if sufficient numbers of cones present and well distributed; scarification probably not required but may shorten regeneration delay period.			

ESSFxv1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Pl	***moisture deficits***		low: Mixed shrub - low forb
	Pa	Bl, Se	Bl, Se	
	S:Bl	***light deficits***		
	Se	----	Pl, Pa	
	•growth of **Bl** and **Se** generally slow, limited by moisture stress; •**Pl** or **Pa** plantations may be suitable option for these sites; •**Pl** natural regeneration expected to be adequate to restock sites if sufficient numbers of cones present and well distributed.			
06	P:Pl	***moisture deficits***		medium: Ericaceous shrub - rhododendron
	S:Bl	Bl, Se	----	
	Se	***summer frost (gentle slopes):***		•cover of white-flowered rhododendron changes little following canopy removal and recovers slowly after clearing or damage to above-ground stems.
	T:Pa	Bl, Se	Bl, Se	
		light deficits (vegetation overtop)		
		Pl, Se, Pa	Pl, Se, Pa	
	•competing vegetation limits plantation survival and growth as well as natural regeneration ingress.			

ESSFxv1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Pl	***summer frost***		medium: Mixed shrub - moist forb
	Bl	Bl, Se	Bl, Se	
	Se	***light deficits***		•abundance and vigour of shrub and herb vegetation variable; on some sites vegetation may increase dramatically following canopy opening.
	T:Pa	Pl, Pa	Pl, Pa	
		cold, moist soils		
		all species	all species	
	•survival and growth of planted **Pl, Bl,** and **Se** expected to be adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Pl** in partial cuts) if planted in sunny / lightly shaded microsites; •Pl natural regeneration generally limited by cold, moist soils and relatively thick forest floor; ingress may be adequate to restock sites if sufficient cones present and well distributed on mineral soil and if competing vegetation is reduced.			
08	P:Pl	***cold, wet soils***		medium: Mixed shrub - sphagnum
	Se	**all species**	**all species**	
	Bl	***summer frost***		•vegetation development limited by cold, wet soils.
		Pl, **Se**, **Bl**	Pl, **Se**, **Bl**	
		light deficits (vegetation overtop)		
		Pl	Pl	
	•productivity for timber very low, and sites very difficult to restock.			

ESSFxv1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
09	P:Se	***cold, wet soils***		medium to high: Mixed shrub - wet forb
	Bl	Se, Bl, Pl	Se, Bl, Pl	
	S:Pl	***summer frost***		
		Se, **Bl**	Se Bl	
		light deficits		
		Se, Bl, **Pl**	Se, Bl, **Pl**	

•survival and growth of planted **Se**, **Bl,** and **Pl** expected to be adequate to restock site if planted on raised microsites and if vegetation controlled at planting spot;

•natural regeneration of **Pl** not a reliable restocking option due to cold, thick soil organic layers and frequent lack of **Pl** cones.

ICHdk Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the ICHdk is even-aged management (clearcutting). Following harvesting, sites are usually broadcast burned to reduce slash and vegetation competition, improve planter access, and reduce forest floor layers for planting. Nearly all harvested sites are planted, usually with Douglas-fir and/or lodgepole pine on mesic and drier sites, and with spruce on wetter sites.

Partial harvesting experience in the ICHdk is essentially nonexistent.

Advance regeneration is predominantly Bl, Cw, and Sxw. Bl and Sxw are mostly of good form and vigour but the Cw usually originates by layering and has incipient decay from the parent tree.

Natural restocking has not been widely used operationally as a regeneration method. Fd, Sxw, and Bl natural regeneration ingress generally occurs on exposed mineral soil in cleared openings where competing vegetation is low and seed is abundant.

Principal Insect and Disease Concerns

Cw has a high risk of heart rot on all sites.
Most Bl stems in the canopy of old stands have extensive heart rot, but some data indicate that younger second-growth stands may have much less heart rot.
White pine weevil causes extensive terminal dieback on vigorous, open-grown Sxw on some sites.
Armillaria root rot affects trees of all conifers but is probably less common than in wetter climates. Partial harvest will increase damage.
Two-year-cycle budworm can cause severe defoliation during high-population years.
Spruce beetle damage can be locally high, especially in areas with windthrow and poor logging, and in creek valleys.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >60 m wide) group selection systems;

Canopy present refers primarily to group selection systems with small to medium (generally 30–60 m wide) harvested groups. It refers to single tree selection systems in /03 (Fd stands) and /09 site series.

ICHdk Site Series - Silviculture Considerations

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>01</td><td>P:Fd</td><td colspan="2"><i>light deficits (vegetation overtop)</i></td><td>most common: medium to high; Mixed shrub - dry shrub</td></tr>
<tr><td></td><td>Pl</td><td>Fd, Pl, Sxw,</td><td>Fd, Pl, Sxw,</td><td>less common: medium; Mixed hardwoods - dry shrub</td></tr>
<tr><td></td><td>Sxw</td><td>At, Ep</td><td>At, Ep</td><td></td></tr>
<tr><td></td><td>S:Bl</td><td colspan="2"><i>moisture deficits (S aspects)</i></td><td>•these sites are often rapidly occupied by shrubs and hardwoods following canopy removal and soil disturbance.</td></tr>
<tr><td></td><td>T:Cw</td><td>Sxw, Bl, Cw, Ep</td><td>Sxw, Bl, Cw, Ep</td><td></td></tr>
<tr><td></td><td>D:At</td><td colspan="2"><i>summer frost (level sites/depressions)</i></td><td></td></tr>
<tr><td></td><td>Ep</td><td>Fd, Cw</td><td>----</td><td></td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Fd, Sxw, and Pl generally adequate to restock clearcut sites and cleared group selection patches if vegetation controlled at planting spot; frost may reduce growth of Fd and Cw on level clearcut sites in some years;
•some advance Bl and nearly all advance Cw regeneration has poor form, branch damage, or incipient decay;
•natural Fd and Sxw regeneration ingress common on clearcuts and small cleared patches if mineral soil is exposed;
•exposed mineral soil usually quickly revegetated; At and Ep abundance often increases significantly following canopy removal and soil disturbance if a seed source is nearby or if they were a component of original stand;
•broadcast burning generally reduces vegetation cover for 2–3 years.</td></tr>
<tr><td>02</td><td>P:Fd</td><td colspan="2"><i>moisture deficits</i></td><td>low; Dry shrub - falsebox</td></tr>
<tr><td></td><td>Pl</td><td>Fd</td><td>Fd</td><td></td></tr>
<tr><td></td><td>D:At</td><td colspan="2"><i>nutrient deficits (shallow soils)</i></td><td>•shrub and herbaceous vegetation cover increase following logging is slow and relatively small.</td></tr>
<tr><td></td><td></td><td>Fd</td><td>Fd</td><td></td></tr>
<tr><td></td><td></td><td colspan="2"><i>rooting restrictions (bedrock)</i></td><td></td></tr>
<tr><td></td><td colspan="4">•timber productivity is low and sites may be difficult to regenerate;
•plantation survival and growth limited by dry soils; partial canopy retention may improve plantation success;
•planting spots limited by shallow soils in Shallow Phase;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

ICHdk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Pl	***moisture deficits***		low; Dry shrub - falsebox
	Fd	**Fd**	Fd	
	D:At	***light deficits (vegetation overtop)***		
		----	Pl, At	
		nutrient deficits		
	•**Pl** stands on these sites most often regenerate naturally following clearcut harvesting if adequate cones present and well distributed, and mineral soil is exposed or forest floor thickness is reduced; •survival and growth of planted **Pl** likely high; vegetation control often not required to meet stocking; •survival and growth of planted **Fd** expected to be poor (moisture stress); may be improved under partial canopy; •soil organic layer and woody debris removal will reduce the already poor moisture and nutrient status of these sites; maintenance of soil organic layers and woody debris especially important if sites managed for **Fd**; •steeply sloping shallow soils susceptible to erosion.			
04	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	**Sxw, Bl**	Sxw, Bl	
	Sxw	***light deficits (dense Bl and Cw)***		•these sites frequently have a high density of advance Bl and Cw regeneration.
	S:Bl	Fd, Pl, At, Ep	Fd, **Pl**, **At**, **Ep**	
	D:At, Ep	***nutrient deficits (coarse soils)***		
	•**Bl** and **Sxw** growth on these sites generally slow but improved by planting on moister microsites in mixture with Pl or Fd; •advance **Cw** and **Bl** regeneration is usually of poor form and with incipient decay, and of low value for timber management; •**Fd**, **Pl**, or **Sxw** plantation performance may be limited by density of Cw and Bl advance regeneration; •removal of forest floor will likely reduce an already poor moisture and nutrient status, especially on coarse-textured soils; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

ICHdk Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>05</td><td>P:Fd
Pl
Sxw
S:Bl
Cw
D:Act, At, Ep</td><td><i>light deficits (vegetation overtop)</i>
Fd, Pl, Sxw, Act, At, Ep
<i>summer frost (gentle slopes)</i>
Fd, Cw, Sxw</td><td>
Fd, Pl, Sxw, Act, At, Ep

-----</td><td>most common: medium to high; Mixed shrub - moist shrub
less common (No or limited canopy only): medium; Mixed hardwood - moist shrub
•shrub and hardwood cover often increases significantly following canopy removal and soil disturbance</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Fd, Pl, Sxw, and Bl generally adequate to restock cleared or partial-cut sites if shrub and herbaceous vegetation controlled at planting spot and (for Fd and Pl) if planted in sunny / lightly shaded microsites;
•dense stands of mixed hardwoods may develop following extensive mineral soil exposure where seed source is present;
•frost damage may be reduced by planting Pl, Sxw, or Bl or by retaining 50% or more of tree canopy;
•most advance Bl > 25 cm tall and nearly all advance Cw regeneration has poor form, branch damage, and incipient decay.</td></tr>
<tr><td>06</td><td>P:Fd
Pl
Sxw
S:Bl
Cw
D:Act, At, Ep</td><td><i>light deficits (vegetation overtop)</i>
Fd, Pl, Act, At, Ep
<i>summer frost (gentle slopes)</i>
Fd, Cw, Sxw</td><td>
Fd, Pl, Act, At, Ep

----</td><td>most common: medium; Mixed shrub - moist forb
less common (No or limited canopy only): medium; Mixed hardwood - moist shrub;
•shrub and hardwood tree cover significantly increase follow canopy removal and soil disturbance</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Fd, Pl, Sxw, and Bl on clearcuts and group selection patches generally adequate to restock sites if vegetation controlled at planting spot and (for Pl and Fd) if trees planted in sunny / lightly shaded microsites;
•competing vegetation can be reduced for 3–5 years by broadcast burning, scarification, or mounding;
•risk of frost damage greatest on gentle lower slopes and where downslope air flow is impeded; risk of damage may be reduced by planting Pl or Bl, or by retaining 50% or more of tree canopy;
•most advance Bl > 25 cm tall and nearly all advance Cw regeneration has poor form, branch damage, and incipient decay.</td></tr>
</table>

ICHdk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Fd	***light deficits (vegetation overtop)***		most common: high; Mixed shrub - moist shrub
	Pl	**Fd**, **Pl**, **Sxw**, Bl, **Act**	**Fd**, **Pl**, **Sxw**, Bl, **Act**	less common: medium; Mixed hardwood - moist shrub
	Sxw	***summer frost***		
	S:Bl	**Fd**, Sxw, Bl	**Fd**, Sxw, Bl	•dense shrub cover typical of these sites
	D:Act	***cold, moist soils***		
		Fd	**Fd**	
	•survival and growth of all species expected to be poor without control of vegetation over seedlings; •planting on raised microsites (natural or artificial) will reduce limitations due to cold soils and overtopping vegetation; •frost-prone sites; damage risk may be reduced by planting **Pl** or **Act** or, to a lesser degree, by planting under a partial canopy; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow; •natural regeneration ingress of **Act** often occurs on exposed mineral soil.			
08	P:Fd	***light deficits (vegetation overtop)***		most common: high; Mixed shrub - tall fern
	Sxw	**all species**	**all species**	less common (No or limited canopy): medium; Hardwood
	S:Bl	***summer frost (gentle slopes)***		-
	Cw	**Fd**, **Cw**	Fd, Cw	moist shrub
	Pl	***cold, wet soils (toe slopes)***		•under a mature canopy, these sites typically have a dense cover of devil's club, which is replaced by a dense cover of other wet-site shrubs and ferns following canopy removal
	D:Act, At, Ep	Fd, Pl	Fd, Pl	
	•tree regeneration limited primarily by competing vegetation; **Fd**, **Sxw**, **Bl**, and **Pl** plantations generally adequate to restock cleared or partial-cut sites if vegetation controlled at planting spot and if planted in sunny / lightly shaded microsites; •moderate-intensity broadcast burn will usually reduce above-ground competing vegetation for 2–3 years; •growth generally improved by planting on raised microsites (natural or artificial) due to warmer soils and reduced vegetaton; •hardwood tree invasion limited by shrub and herbaceous vegetation; may be rapid if this vegetation is reduced; •risk of frost damage principally on level terrain where cold air accumulates; risk present but less on steeper slopes.			

ICHdk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
09	P:Sxw	***cold, wet soils***		medium; Mixed shrubs - wet forb;
	S:Bl	Sxw, Bl, Pl	Sxw, Bl, Pl	
	Pl	***summer frost***		•patches of Wet alder vegetation common.
	D:Act	**Sxw**, **Bl**	**Sxw**, **Bl**	
		light deficits		
		Pl, **Act**	Sxw, Bl, **Pl**, **Act**	

- low-productivity sites for timber, and restocking often difficult;
- survival and growth of all tree species best on raised microsites (natural or artificial) due to warmer soils and reduced above-ground vegetation competion; plantable spots limit planting density;
- plantation growth generally slow;
- **Pl** uncommon; mature **Pl** not well adapted to wet sites;
- risk of frost damage to planted **Sxw** may be reduced somewhat by partial tree or shrub canopy; effects of partial canopy may be overwhelmed by cold air accumulation, especially if large upslope source of cold air is present;
- sites very susceptible to soil rutting and compaction;
- trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.

ICHmk3 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture systems are currently even-aged (clearcutting) management. Following harvesting, sites are usually broadcast burned to reduce slash and vegetation competition, improve planter access, and reduce forest floor layers for planting. Nearly all harvested sites are planted, usually with Douglas-fir and/or lodgepole pine on mesic and drier sites and with spruce on wetter sites. Wetter sites are often mounded to create warmer, better-drained soils for initial seedling establishment.

Partial harvesting experience in the ICHmk3 is essentially nonexistent.

Advance regeneration is primarily Cw and Bl, which are often very dense. Bl stems <25 cm tall usually have good form and vigour, but taller stems are often old and have incipient decay. Cw often originates by layering and typically has incipient decay from the parent tree.

Natural restocking has not been widely used operationally as a regeneration method. Fd, Sxw, Bl, and Cw, as well as Act and At natural regeneration ingress, generally occupy exposed mineral soil in cleared openings if vegetation is not dense and seed is abundant.

Principal Insect and Disease Concerns

Cw has a high risk of heart rot on all sites.
Most Bl stems in the canopy of old stands have extensive heart rot, but some data indicate that younger second-growth stands may have much less heart rot.
White pine weevil is a major concern, causing extensive terminal dieback on vigorous, open-grown Sxw on some sites.
Armillaria root rot affects isolated trees and large infection centres, often killing all conifer trees. Partial harvest will increase armillaria damage.
Tomentosus and laminated root disease are also prevalent.
Warren's root collar weevil can cause moderate damage in some plantations, especially with deep, moist forest floor.
Black army cutworm can cause extensive mortality in some plantations on recently burned sites.
Spruce beetle can cause high mortality locally, especially on sites with windthrow or poor logging.

Sxw and Bl may experience severe defoliation from two-year-cycle budworm in high-population years.
Bl has moderate to high risk of attack from balsam bark beetle.
Western spruce budworm has locally caused severe defoliation of Fd.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >60 m wide) selection systems;

Canopy present refers primarily to group selection systems with smaller (generally 30–60 m wide) patches. On warm, dry sites (site series /03) and very wet sites (site series /07), it refers to low- to moderate-volume removal single tree selection systems.

ICHmk3 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***light deficits (vegetation overtop)***		most common: medium; Mixed shrub - dry shrub
	Pl	**Fd**, **Pl**, Sxw,	**Fd**, **Pl**, Sxw,	less common (No or limited canopy): medium; Mixed
	Sxw	**Act**, **At**, **Ep**	**Act**, **At**, **Ep**	hardwood - dry shrub
	S:Bl	***summer frost (gentle slopes)***		•Ep and Act commonly seed in on exposed mineral soils and
	T:Cw	Fd, Cw	----	may dominate site for several years;
	D:Act, At, Ep	***moisture deficits (submesic sites)***		•advance Bl regeneration may limit success of planted stock.

- survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared or partial-cut sites if vegetation and dense advance regeneration controlled at planting spot and (for **Pl** and **Fd** in partial cuts) if planted in sunny / lightly shaded microsites;
- moderate-intensity broadcast burn will usually reduce above-ground competing vegetation for 3–5 years;
- most advance **Cw** regeneration originates by layering and has incipient heart rot from parent tree;
- advance **Bl** regeneration >25 cm tall frequently has poor form, branch damage, and incipient decay;
- post-harvest natural regeneration ingress of **Fd**, **Sxw**, **Bl**, and **Cw** anticipated in small openings and near mature forest edge where mineral soil is exposed; small **Cw** established naturally from seed usually free of heart rot but probability of forming a sound crop tree is uncertain;
- dense stands of mixed hardwoods often result from extensive mineral soil exposure where there are adjacent seed sources.

ICHmk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	Sxw, Bl	Sxw, Bl	
	T:Bl	***light deficits***		•shrub and herb vegetation increase following canopy removal is slow and generally small.
	Sxw	----	Fd, Pl	
	D:At	***nutrient deficits***		
	•sites have low productivity for timber and significant challenges for reforestation; survival of planted **Pl** and **Fd** may be adequate to restock sites if planted in microsites with deeper soil; vegetation control usually not required; •**Pl** natural regeneration should be adequate to restock sites if sufficient cones present and well distributed; •**Fd** natural regeneration establishment common under partial **Fd** canopy but not on large cleared areas; •maintenance of soil organic layers and woody debris important for long-term nutrient availability and natural regeneration; •risk of site degradation due to site preparation (including broadcast burning) is high.			
03	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	Fd	Fd	
	D:At	***high surface temperatures (recently burned sites)***		•vegetation increase following logging generally slow and small.
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature **Fd**; •**Pl** natural regeneration ingress likely slow but probably adequate to restock sites if sufficient cones present and well distributed; •survival and early growth of planted **Fd** expected to be poor due to moisture stress and high soil surface temperatures; •planted **Pl** survival and growth usually adequate to restock sites without vegetation control; •maintenance of soil organic layers important for long-term nutrient availability and natural regeneration.			

ICHmk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd	***light deficits (vegetation overtop)***		most common: medium; Mixed shrub - moist forb
	Sxw	**Fd**, **Pl**, **Act**,	**Fd**, **Pl**, **Act**,	less common (No or limited canopy): high; Mixed hardwood -
	S:Bl	**At**, **Ep**	**At**, **Ep**	dry shrub;
	Cw	***summer frost***		
	Pl	**Fd**, **Cw**	Fd, Cw	•Ep and Act commonly seed in on exposed mineral soil from
	D:Act, At, Ep			adjacent stands and may dominate the site for many years.
	•survival and growth of planted **Fd**, **Sxw**, **Bl**, and **Pl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Fd** and **Pl** in partial cuts) if planted in sunny / lightly shaded microsites; •moderate-intensity broadcast burn or mounding will usually reduce above-ground competing vegetation for 2–3 years; •**Fd** and **Cw** have high risk of frost damage on lower slopes and other sites with poor air drainage; risk of frost damage is likely reduced by maintaining a partial tree canopy; •most advance **Bl** >25 cm tall and nearly all advance **Cw** regeneration has poor form, branch damage, and incipient decay; •advance **Sxw** regeneration generally of good form and vigour; •soils moist throughout most of the growing season; risk of soil rutting and compaction generally high except when frozen.			
05	P:Sxw	***light deficits (vegetation overtop)***		high; Mixed shrub - moist shrub
	S:Bl	**Sxw**, **Pl**, **Act**	**Sxw**, **Pl**, **Act**	
	Cw	***summer frost***		•shrub and herbaceous cover may increase significantly
	Pl	**Sxw**, **Bl**, **Cw**	**Sxw**, **Bl**, **Cw**	following canopy removal.
	D:Act	***cold, moist soils***		
		Sxw, Bl, Cw, Pl	Sxw, Bl, Cw, Pl	
	•very frost-prone sites; damage to **Sxw** and **Bl** may be reduced by planting on raised microsites / exposed mineral soil; •raised microsites should improve rooting zone soil temperature and growth of **all species** (planted and natural); •most advance **Bl** regeneration >25 cm tall and nearly all advance **Cw** has poor form, branch damage, and incipient decay.			

ICHmk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd	***light deficits (vegetation overtop)***		most common: high; Mixed shrub - tall fern
	Sxw	**all species**	**all species**	less common (No or limited canopy): high; Mixed hardwood - moist shrub
	S:Bl	***summer frost (toe slopes)***		
	Cw	**Fd**, Sxw, **Cw**	**Fd**, **Cw**	
	Pl	***snowpress***		•abundant devil's club present prior to canopy removal is generally replaced by a dense cover of other shrubs and forbs including tall ferns following canopy removal.
	D:Act	**all species**	**all species**	
	Ep	***cold, wet soils (toe slopes)***		
		Fd, Pl	Fd, Pl	

•these are very productive sites for growth of trees, shrubs, and other vegetation;
•restocking of cleared or partial-cut sites with trees (**all species**) requires control of vigorous competing vegetation;
•moderate-intensity broadcast burn or mounding will usually reduce above-ground competing vegetation for 2–3 years;
•growth of all tree species improved by planting on raised microsites due to increased soil temperatures and soil drainage;
•management for **Fd** and **Cw** on gently sloping sites at the base of slopes will require measures to reduce frost damage;
•wet soils result in high risk of soil compaction and rutting.

ICHmk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Sxw	***summer frost***		most common: medium; Mixed shrub - wet forb
	S:Bl	**Sxw**, **Bl**, **Cw**	**Sxw**, **Bl**, **Cw**	
	Cw	***cold wet soils***		•patches of wet alder vegetation common.
	Pl	**Sxw**, **Bl**, **Pl**, **Cw**	**Sxw**, **Bl**, **Cw**, **Pl**	
	D:Act	***light deficits (vegetation overtop)***		
		Sxw, **Pl**, **Act**	Sxw, **Pl**, **Act**	

•low-productivity sites for timber; difficult to reforest due to cold, wet soils and frequent summer frost;

•survival and growth of planted tree species (**all species**) generally poor except on raised microsites (natural or artificial); little affected by level of canopy removal;

•**Pl** is not common on these sites; mature **Pl** not well adapted to sites with near-surface water table;

•risk of summer frost damage to planted **Sxw**, **Bl**, and **Cw** may be somewhat reduced by leaving partial tree or shrub canopy or by planting in mixtures with deciduous species; effects may be overwhelmed by cold air accumulation if large upslope cold air source is present;

•advance **Sxw** and **Bl** regeneration <25 cm tall frequently of good form and moderate vigour; may contribute to stocking;

•soils very susceptible to rutting and compaction;

•trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.

ICHwk2 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture systems are currently even-aged (clearcutting) management. Following harvesting, sites are usually broadcast burned to reduce slash and vegetation competition, improve planter access, and reduce forest floor layers for planting. Nearly all harvested sites are planted, usually with Douglas-fir, lodgepole pine, and/or spruce on mesic and drier sites, and with spruce on wetter sites. Wetter sites are often mounded to create warmer, better-drained soils for initial seedling establishment. Restocking success requires prompt planting.

Partial harvesting experience is essentially nonexistent.

Advance regeneration in old stands is primarily Hw and Cw. Bl is common on some sites. Cw mostly originates by layering and typically has incipient decay from the parent tree. Hw and Bl >25 cm tall are often old and of poor form, and have incipient decay.

Natural restocking and/or protection of advance regeneration has not been widely used operationally as a regeneration method. Fd, Sxw, Bl, Cw, and Hw, as well as Act and Ep natural regeneration ingress, generally occupy exposed mineral soil in cleared openings if vegetation is not dense and seed is abundant.

Principal Insect and Disease Concerns

Cw and Hw have a high risk of heart rot on all sites.
Most Bl stems in the canopy of old stands have extensive heart rot, but younger second-growth stands may have much less heart rot.
White pine weevil is a major concern, causing extensive terminal dieback on vigorous, open-grown Sxw on some sites.
Armillaria root rot affects isolated trees and large infection centres, often killing most conifer trees. Partial harvest will increase armillaria damage.
Laminated root rot locally causes significant mortality of Fd.
Warren's root collar weevil damage is moderate in some plantations, especially with deep, moist forest floor.
Black army cutworm has caused extensive mortality in some plantations on recently burned sites.
Spruce beetle can cause high mortality locally, especially on sites with windthrow or poor logging.

Sxw and Bl may experience severe defoliation from two-year-cycle budworm in high-population years.
Bl has moderate to high risk of attack from balsam bark beetle.
Defoliation of Sxw, Hw, and Cw by western hemlock looper can locally be high in high-population years.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >60 m wide) selection systems;

Canopy present refers primarily to group selection systems with small to medium (generally 30–60 m wide) harvested groups. In site series /03 (Fd-dominated) and /08, it refers to low-volume single tree selection systems.

ICHwk2 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd Pl Sxw S:Bl Cw Hw D:At, Act,Ep	***light deficits (vegetation overtop)*** **Pl**, **Fd**, Sxw, Bl, **At**, **Act**, **Ep** ***summer frost (gentle slopes)***	**Fd**, **Pl**, Sxw, Bl, **At**, **Act**, **Ep**	most common: medium to high; Mixed shrub - moist forb; less common (no or limited canopy): medium; Mixed hardwood - dry shrub •shrubs, tall forbs, and often hardwoods increase dramatically following canopy removal and mineral soil exposure.

- •survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Fd** and **Pl** in partial cuts) if planted in sunny / lightly shaded microsites;
- •**Act** and **Ep** readily establish naturally and thrive where mineral soil is exposed;
- •natural regeneration of **Fd**, **Sxw**, **Bl**, **Cw**, and **Hw** can be expected in small openings and near the edge of the mature forest where mineral soil is exposed following harvesting;
- •nearly all advance **Cw** regeneration originating from layering and most advance **Cw** and **Hw** regeneration >25 cm tall has poor form, poor vigour, or incipient heart rot;
- •growing-season frosts on level sites and slight depressions in gently rolling topography reduces growth of planted **Fd**, **Cw**, and **Hw** in some years;
- •moderate-intensity broadcast burn will usually reduce above-ground vegetation for 2–3 years on north aspects and possibly longer on south aspects.

ICHwk2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	Fd, **Bl**, **Hw**	**Bl**, Hw	
	T:Bl	***light deficits***		•vegetation increase following logging is generally small and slow; cover of shrubs and herbs >20 cm tall generally small.
	Hw	----	Fd, **Pl**	
		nutrient deficits		
		rooting restrictions (bedrock)		
	•timber productivity low, and sites often difficult to regenerate following canopy clearing due to thin, dry soils; •long-term site productivity significantly reduced by broadcast burning, organic layer / woody debris removal, or soil erosion; •planted **Pl** surivival and growth usually moderate to high on microsites of deeper soil with full sun or light shade; •partial Fd canopy retention will promote **Fd** natural regeneration and maintainence of site productivity; •these sites best suited to conifers tolerant of low-nutrient, acidic soils (**Pl** and **Hw**); •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			
03	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	Fd, **Bl**, **Hw**	Bl, Hw	
	T:Bl	***light deficits***		•vegetation increase following logging is generally small and slow.
	Hw	----	Fd, **Pl**	
		rooting restrictions (bedrock)		
	•same as ICHwk2/02 except these sites are more suited to conifers preferring neutral to alkaline soils (**Fd**).			

ICHwk2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd	***moisture deficits***		most common: low; Mixed shrub - low forb
	Pl	**Bl**, **Cw**, Sxw	Bl, Cw, Sxw	less common (No or limited canopy): low to medium; Mixed hardwood - dry shrub
	T:Bl	***light deficits***		
	Hw	----	**Pl**, **At**, **Ep**	
	Cw	***nutrient deficits (sandy soils)***		•extensive mineral soil exposure may result in dramatically increased cover of hardwoods, fireweed, and grasses.
	Sxw			
	D:At, Ep			
	•natural ingress (seeding in) of deciduous trees abundant if mineral soil exposed and seed source is present; •survival and early growth of planted **Fd** and **Pl** generally adequate to restock cleared site without site preparation; growth of **Pl** likely slow in shaded microsites of partial-cut sites; •survival of planted **Bl**, **Hw**, **Cw**, and **Sxw** likely poor to moderate, and best on moist microsites under partial canopy; •shelterwood or other partial harvest silviculture system may be especially suitable for regeneration of **Fd** stands; •maintenance of soil organic layers and woody debris important for long-term productivity and natural regeneration.			
05	P:Pl	***light deficits (vegetation overtop)***		medium; Mixed shrub - moist shrub
	Sxw	**Pl**, Sxw, **Act**	**Pl**, **Act**	
	S:Bl	***summer frost***		•shrub and herbaceous vegetation generally increases following canopy opening but is less abundant than on some wetter sites.
	Cw	Sxw, Bl, Cw	Sxw, Bl, Cw	
	D:Act	***cold, moist soils***		
	•survival and growth of planted **Sxw** and **Pl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and if planted in sunny / lightly shaded microsites; •moderate-intensity broadcast burn or mounding will usually reduce above-ground competing vegetation for 3–4 years; •frost damage may be reduced by planting on raised microsites, under partial canopy, or as part of Pl-dominated mixture; •advance **Bl** regeneration >25 cm tall often of poor form and vigour, and with incipient decay.			

ICHwk2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Sxw	***light deficits (vegetation overtop)***		high; Mixed shrub - moist shrub
	S:Bl	**Sxw**, **Bl**, **Pl**, **Act**	**Sxw**, **Bl**, **Pl**, **Act**	
	Pl	***summer frost***		•black twinberry and thimbleberry often dominate site prior to canopy removal and persist following removal;
	D:Act	Sxw, Bl	Sxw, Bl	
		cold, wet soils		•reedgrass-dominated vegetation often follows scarification where and when reedgrass seed is abundant.
		Sxw, Bl, Pl	Sxw, Bl, Pl	
	•vegetation control essential for regeneration; vegetation control may be difficult to achieve by burning on these wet sites; •frost hazard may be reduced by planting **Pl** or **Act** or, less so, by planting under a partial canopy or in Pl-dominated mixture; •growth of **Sxw**, **Bl**, and **Pl** best on raised microsites (artificial or natural); •advance **Bl** regeneration >25 cm tall often of poor form and vigour, and with incipient decay.			
07	P:Fd	***light deficits (vegetation overtop)***		most common: high; Mixed shrub - tall fern
	Sxw	***all species***	***all species***	occasional: high; Mixed hardwood - moist shrub
	S:Bl	***summer frost (gentle slopes)***		
	Cw	**Fd**, **Cw**, **Hw**	**Fd**, Cw, Hw	•above-ground shrub and herb growth is vigourous;
	Hw	***cold, wet soils (toe of slopes):***		•the high percent cover of devil's club is usually replaced by other moist-site shrubs and forbs following canopy removal.
	Pl	**Fd**, Pl	**Fd**, Pl	
	D:Act, Ep	***snowpress***		
	•survival and growth of planted **Fd**, **Sxw**, **Bl**, and **Pl** can restock cleared and partial-cut sites if vegetation is controlled at planting spot and, for **Fd** and **Pl** in partial cuts, if planted in sunny / lightly shaded microsites; •planting on raised microsites should reduce vegetation competition, warm soils, and increase survival and growth of trees; •abundant **Act** often establishes on exposed mineral soil following canopy opening; •frost may limit establishment of **Fd**, **Cw**, and **Hw** locally in depressions and on gentle topography; •most advance **Bl** regeneration >25 cm tall and nearly all advance **Cw** has poor form, branch damage, and incipient decay.			

ICHwk2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Sxw	***summer frost***		medium; Mixed shrub - wet forb
	S:Bl	**Sxw**, **Bl**, **Cw**, **Hw**	Sxw, Bl, Cw, Hw	
	Cw	***cold, wet soils***		•patches of Wet alder - fern vegetation common.
		all species	**all species**	
	D:Act	***light deficits (vegetation overtop)***		
	T:Hw	**Act**	Sxw, **Act**	

- sites difficult to regenerate due to cold, wet soils; survival and growth of planted conifers generally poor except on raised microsites (natural or artificial); plantable spots limit planting density;
- water table may rise following canopy removal;
- partial canopy retention may slightly reduce frost damage to seedlings but effects usually overwhelmed by cold air accumulation if a large upslope cold air source is present;
- most advance **Bl** regeneration >25 cm tall and nearly all advance **Cw** has poor form, branch damage, and incipient decay;
- broadcast burn with sufficient intensity to control competing vegetation is unlikely; shrubs may be stimulated by soil warming.

ICHwk4 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture systems are currently even-aged (clearcutting) management. Following harvesting, sites are usually broadcast burned to reduce slash and vegetation competition, improve planter access, and reduce forest floor layers for planting. Nearly all harvested sites are planted, usually with Douglas-fir, lodgepole pine, or spruce on mesic and drier sites, and with spruce on wetter sites. Wetter sites are often mounded to create warmer, better-drained soils for initial seedling establishment. Restocking success requires prompt planting following site preparation.

Partial harvesting experience is essentially nonexistent.

Advance regeneration in old stands is primarily Hw and Cw. Bl is common on some sites. Cw mostly originates by layering and typically has incipient decay from the parent tree. Hw and Bl >25 cm tall are often old and of poor form, and have incipient decay.

Natural restocking and/or protection of advance regeneration has not been widely used operationally as a regeneration method. Fd, Sxw, Bl, Cw, and Hw, as well as Act and Ep natural regeneration ingress, generally occupy exposed mineral soil in cleared openings if vegetation is not dense and seed is abundant.

Principal Insect and Disease Concerns

Cw and Hw have a high risk of heart rot on all sites.
Most Bl stems in the canopy of old stands have extensive heart rot, but younger second-growth stands may have much less heart rot.
White pine weevil is a major concern, causing extensive terminal dieback on vigorous, open-grown Sxw on some sites.
Armillaria root rot affects isolated trees and large infection centres, often killing most conifer trees. Partial harvest will increase armillaria damage.
Laminated root rot locally causes significant mortality of Fd.
Warren's root collar weevil damage is moderate in some plantations, especially with deep, moist forest floor.
Black army cutworm has caused extensive mortality in some plantations on recently burned sites.

Spruce beetle can cause high mortality locally, especially on sites with windthrow or poor logging.
Sxw and Bl may experience severe defoliation from two-year-cycle budworm in high-population years.
Bl has moderate to high risk of attack from balsam bark beetle.
Defoliation of Sxw, Hw, and Cw by western hemlock looper can locally be high in high-population years.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >60 m wide) selection systems;

Canopy present refers primarily to group selection systems with small to medium (generally 30–60 m wide) harvested groups. In site series /03 (Fd-dominated) and /08, it refers to low-volume single tree selection systems.

ICHwk4 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd Pl Sxw S:Bl Cw Hw D:Act, At, Ep	***light deficits (vegetation overtop)*** **Fd**, **Pl**, Sxw, Bl, **Act**, **At**, **Ep** ***summer frost (gentle slopes)***	 **Fd**, **Pl**, Sxw, Bl, **Act**, **At**, **Ep**	most common: medium to high; Mixed shrub - moist forb less common (No or limited canopy): medium; Mixed hardwood - dry shrub •shrubs, tall forbs, and often hardwoods increase dramatically on exposed mineral soil following canopy removal.
	•survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites if planted promptly; vegetation controlled at planting spot and (for **Fd** and **Pl**) if planted in sunny / lightly shaded microsites; •moderate-intensity broadcast burn will usually reduce above-ground competing vegetation for 2–3 years; •natural ingress of **Hw** and **Cw** can be expected on exposed mineral soil following partial or full canopy removal; •**Act** and **Ep** quickly establish (seed-in) on exposed mineral soil if there is a nearby seed source; •most advance **Bl** regeneration >25 cm tall and nearly all advance **Cw** and **Hw** has poor form or incipient decay; •frost damage may limit survival and growth of planted **Fd**, **Cw**, **Sxw**, or **Bl** on gentle slopes in some years with late frosts.			
02	P:Fd Pl T:Bl Hw	***moisture deficits*** Fd, **Bl**, **Hw** ***light deficits*** ---- ***nutrient deficits and rooting restrictions***	 Bl, Hw Fd, **Pl**	low; Dry shrub - falsebox •shrub and herbaceous vegetation increase following logging generally small and relatively slow.
	•timber productivity low; maintenance of soil organic layers and woody debris important for long-term productivity; •sites with very shallow soils difficult to reforest; growth of planted trees best on microsites with deeper soils; •partial canopy retention may promote natural regeneration establishment; •these sites best suited to conifers tolerant of low-nutrient acidic soils (**Pl**, **Hw**).			

ICHwk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	Fd, **Hw**, At	Hw, At	
	T:Hw	***light deficits***		•shrub and herbaceous vegetation increase following logging generally small and relatively slow.
	D:At	----	Fd, **Pl**, **At**	
		rooting restrictions (bedrock)		
	•same as for ICHwk4/02 except these sites are also suited to conifers preferring neutral to alkaline soils (**Fd**)			
04	P:Fd	***summer frost***		low; Ericaceous shrub - low shrub
	Pl	**Fd**, Sxw, Bl, **Hw**	Fd, Sxw, Bl, Hw	
	Sxw			•shrub and herbaceous vegetation increases relatively little following canopy clearing.
	S:Bl	***moisture deficits***		
	Hw	**Sxw**, **Bl**	Sxw, Bl	
	D:At	***light deficits (vegetation overtop)***		
		----	Fd, **Pl**, **At**	
		nutrient deficits		
	•maintenance of soil organic layers and woody debris important for long-term productivity and regeneration; •**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed on mineral soil; scarification likely required; natural ingress and growth slow in shaded microsites on partial-cut sites; •survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared sites; site preparation usually not required; growth of **Fd** and **Pl** likely slow in shaded microsites of partial cuts; •frost damage to **Sxw** and **Fd** may be reduced by planting under partial canopy or nurse crop, or as part of Pl-dominated mixture.			

ICHwk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Fd Pl S:Hw T:Bl Cw Sxw D:At, Ep	***moisture deficits*** **Bl**, **Cw**, **Sxw** ***light deficits*** ---- ***nutrient deficits (sandy soils)***	 Bl, Cw, Sxw **Pl**, **At**, **Ep**	most common: low; Mixed shrub - low forb less common (No or limited canopy): low to medium; Mixed hardwood - dry shrub •extensive mineral soil exposure may result in significantly increased cover of hardwoods, shrubs, and some forbs such as fireweed.
	•survival and growth of planted **Fd** and **Pl** generally adequate to restock cleared sites without site preparation; growth of **Pl** likely slow in shaded microsites of partial-cut sites; •retention of soil organic layers and woody debris important for long-term productivity on droughty, nutrient-poor (sandy) soils; •hardwoods (**Ep**, **At**) establish naturally following harvesting if present in original stand or if a nearby seed source is present.			
06	P:Sxw S:Bl Pl D:Act	***light deficits (vegetation overtop)*** **Sxw**, **Bl**, **Pl**, **Act** ***summer frost*** **Sxw**, Bl ***cold, wet soils*** Sxw, Bl, Pl	 **Sxw**, **Bl**, **Pl**, **Act** Sxw, Bl Sxw, Bl, Pl	most common: high; Mixed shrub - moist shrub •black twinberry and thimbleberry often dominate site prior to canopy removal and persist following removal; •reedgrass-dominated vegetation often develops if abundant seed present when mineral soil exposed.
	•survival and growth of planted **Sxw**, **Bl**, and **Pl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Pl** in partial cuts) if planted in sunny / lightly shaded microsites; •broadcast burn often difficult to achieve on these wet sites; •risk of frost damage to **Sxw** and **Bl** may be reduced by planting under partial canopy or nurse crop of Pl; •planting on raised microsites (natural or artificial) will improve rooting zone soil temperatures and growth of **Sxw**; •most advance **Bl** regeneration <25 cm tall and nearly all advance **Sxw** is of good form and can contribute to restocking.			

ICHwk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Fd	*light deficits (vegetation overtop)*		most common: high; Mixed shrub - tall fern
	Sxw	all species	all species	occasional: high; Mixed hardwood - moist shrub
	S:Bl	*summer frost (gentle slopes)*		
	Cw	Fd, Cw, Hw	Fd, Cw, Hw	•the high percent cover of devil's club is usually replaced by other shrubs and forbs following canopy removal.
	Hw	*cold, wet soils (toe slopes)*		
	Pl	Fd, Sxw, Bl, Pl, Ep	Fd, Sxw, Bl, Pl, Ep	•cottonwood establishes quickly following extensive mineral soil exposure if seed source is present.
	D:Act, Ep	*snowpress*		
	•vegetation control generally essential for prompt reforestation of all species; spot treatments may be most effective; •abundant **Act** may establish by seeding-in on exposed mineral soils; •summer frost damage to **Fd**, **Cw**, and **Hw** may be significant locally in some years; •planting on raised microsites (natural or artificial) will improve rooting zone temperatures and growth of **all species**, especially on wet toe slopes; •most advance **Bl** regeneration >25 cm tall and nearly all advance **Cw** has poor form, branch damage, or incipient decay;.			
08	P:Sxw	*summer frost*		most common: medium; Mixed shrub - wet forb
	S:Bl	Sxw, Bl, Cw	Sxw, Bl, Cw	
	Cw	*cold, wet soils*		•Wet alder - fern communities often form patches in this complex;
	Pl	Sxw, Bl, Cw, Pl	Sxw, Bl, Cw, Pl	
	D:Act	*light deficits*		•soil disturbance may result in increased shrub or herbaceous vegetation abundance.
		Pl, Act	Pl, Act, Sxw	
	•sites difficult to regenerate due to cold, wet soils; growth poor except on raised microsites (natural or artificial); •water table may rise following canopy removal; •partial canopy retention may slightly reduce frost damage but beneficial effects likely overwhelmed by cold air accumulation; •advance **Bl** regeneration <25 cm tall and most advance **Sxw** is of good form and can contribute to restocking.			

IDFdk3 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture systems are currently a form of single tree selection (faller selection) in Fd stands and clearcutting in Pl stands. The selection system in Fd stands is based on an objective for residual basal area, maximum diameter class, diameter class width, and diminuation quotient for diameter classes. Stand regeneration is achieved by release of advance regeneration and natural regeneration ingress. Dense advance regeneration is usually spaced subsequent to logging. In Pl stands with scattered Fd, the Fd are generally not harvested, and advance Fd regeneration is protected. Regeneration of Pl stands is primarily by natural regeneration ingress without scarification. There is a trend to regenerate Pl stands by planting.

Advance regeneration in Fd stands is virtually all Fd and is often dense. Density has probably increased markedly in recent years due to wildfire control. High advance regeneration densities result in below-ground competition for moisture and nutrients, and may result in growth reductions not only to advance regeneration stems but also to canopy stems. Advance Fd regeneration is generally of good form and vigour, and its growth responds well to canopy opening. Growth generally increases with increasing sunlight, although stems with thin, non-furrowed bark often suffer sunscald when exposed to sunlight after growing in shade. Advance regeneration in Pl stands is generally sparse.

Natural restocking is the normal regeneration method in Fd and Pl stands. Survival of planted Fd on cleared areas has generally been poor due to frequent summer frost and moisture stress.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost is a significant factor reducing initial establishment and growth of planted Fd on cleared areas. Diseases such as Dermea canker can be associated with frost injury on Fd.
Douglas-fir beetle causes frequent mortality of mature Fd, especially those under moisture stress or damaged by logging.
Laminated root rot and Armillaria root disease commonly kill pockets of Fd stems, both mature and immature.

Western spruce budworm can cause severe defoliation in southern portions of IDFdk3; regeneration in partial harvesting systems may experience extreme damage.
Douglas-fir tussock moth occasionally defoliates and kills Fd.
Growth of Pl natural regeneration is commonly reduced by dwarf mistletoe if an inoculum source is present.
Western gall rust and blister rusts are also common on regeneration, and reduce growth.
Pine needle cast disease is very common on Pl regeneration after wet springs and summers and may result in growth reductions.
Mountain pine beetle kills mature Pl trees, especially those under environmental stress, but is less common than in the SBPS Zone.
Squirrels can cause significant damage to plantations during high-population periods.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >50 m wide) selection systems;

Canopy present for Fd stands includes single tree selection and faller selection systems with up to 60% volume removal as well as low-volume small group selection systems where groups of 2–4 trees are felled. In Pl stands, **canopy present** includes group selection with small to medium-size (25–50 m wide between mature stand edges) harvested groups.

IDFdk3 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***moisture deficits***		most common: medium; Pinegrass - low forb
	Pl	**Fd**, **Sxw**	Fd, **Sxw**	less common: medium; Dry alder - pinegrass (mostly higher elevations)
	T:Sxw (upper elevations)	***summer frost*** Fd	----	
		light deficits		•Fd advance regeneration densities frequently high, resulting in increased moisture stress to individual stems; •pinegrass cover and vigour generally increases following canopy removal; pinegrass is strong competitor for soil moisture; •soopollalie may add significant nitrogen to site.
	D:At	----	Pl, At	

- •most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd or Pl/Fd;
- •excessive opening of mature Fd stand may result in sunscald injury and shock to **Fd** advance regeneration;
- •light ground disturbance should increase density of **Fd** natural regeneration ingress under moderate tree canopy;
- •excessive stocking of advance regeneration reduces stand vigour; growth generally improved by thinning of dense patches;
- •survival of planted **Fd** in clearings highly variable and often poor due to moisture stress (increased by grass competition for moisture) and frost; survival of planted **Pl** generally moderate to high in sunny or lightly shaded microsites;
- •survival of planted **Fd** and **Pl** in clearings may be increased by site preparation that increases planting site moisture availability and reduces grass competition for moisture;
- •**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of Pl cones present and well distributed on mineral soil; scarification (light drag) may reduce regeneration delay;
- •downed and decaying wood provides microsites for natural regeneration ingress and nutrient availability.

IDFdk3 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>02</td><td>P:Fd
Pl</td><td><i>moisture deficits</i>
Fd
<i>nutrient deficits</i>
Fd
<i>high surface temperatures</i></td><td>
Fd

Fd</td><td>low; Dry shrub - kinnikinnick
•pinegrass is strong competitor for soil moisture on these sites.</td></tr>
<tr><td></td><td colspan="4">•timber productivity low and sites very difficult to regenerate following logging;
•Fd natural regeneration ingress following logging expected to be greatest where residual volume is high; may be increased by microsite variability including downed wood; regeneration occurs primarily in shaded microsites but not in rainshadow directly beneath larger trees;
•survival of planted Fd very poor; survival of planted Pl expected to be poor to moderate, but little experience managing for Pl;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>03</td><td>P:Fd
Pl</td><td><i>moisture deficits</i>
Fd, Pl
<i>rooting restrictions (bedrock)</i></td><td>
Fd, Pl</td><td>low; Dry shrub - kinnikinnick</td></tr>
<tr><td></td><td colspan="4">•timber productivity very low and sites very difficult to regenerate following logging;
•Fd natural regeneration ingress likely greatest where residual volume near natural levels;
•survival of planted Fd likely poor; survival of planted Pl likely poor to moderate; growth of established individual Fd and Pl stems best in full sunlight;
•downed and decaying wood important as microsites for natural regeneration ingress and nutrient availability;
•maintenance of soil organic layers and woody debris important for long-term site productivity.</td></tr>
</table>

IDFdk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd	***moisture deficits***		low; Dry shrub - kinnikinnick
	Pl	**Fd**, **Pl**, **At**	**Fd**, **Pl**, **At**	•grasses are very effective competitors with tree seedlings for moisture.
	D:At	***high surface temperatures***		
	•timber productivity very low and sites difficult to regenerate; •**Pl** is uncommon on these and other steep south and west aspects in the IDFdk3; •survival of planted **Fd** poor; survival of planted **Pl** expected to be poor to moderate; •**Fd** natural regeneration ingress following logging expected to be greatest where residual volume is near natural levels; regeneration occurs primarily in shaded microsites but not in rainshadow directly beneath larger trees; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
05	P:Fd	***moisture deficits***		most common: medium; Pinegrass - low forb
	Pl	Fd	Fd	less common: medium; Dry alder - pinegrass (mostly high elevations)
	D:At	***light deficits***		
		----	Pl, At	•pinegrass generally increases following timber harvesting; •pinegrass is an effective competitor for moisture.
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems greatest in full sunlight; •excessive stocking of advance regeneration reduces stand vigour; growth generally improved by thinning of dense patches; •survival of planted **Fd** in clearings highly variable and often poor due to moisture stress (increased by grass competition for moisture) and frost; survival of planted **Pl** generally moderate to high in sunny or lightly shaded microsites; •survival of planted **Fd** and **Pl** in clearings may be increased by site preparation, which increases planting site moisture availability and reduces grass competition for moisture; •light ground disturbance may increase Fd regeneration ingress under partial canopy; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration; •surface erosion hazards moderate on steep slopes if surface water is channeled.			

IDFdk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd	***moisture deficits***		medium; Dry shrub - kinnikinnick
	Pl	**Fd**	Fd	
	D:At	***light deficits***		•pinegrass is a very effective competitor for moisture on these sites.
		----	Pl, At	
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest under full sunlight; •excessive opening of mature Fd stand may result in sunscald injury and shock to **Fd** advance regeneration; •survival of planted **Fd** generally poor; survival of planted **Pl** likely moderate to high; survival and growth of **Pl** and especially **Fd** may be improved by removal of grasses around tree and by planting in shallow depressions; •natural regeneration ingress of **Fd** greatest where mature Fd trees provide partial shade; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			
07	P:Fd	***moisture deficits***		low; Pinegrass - low forb
	Pl	**Sxw**	Sxw	
	Sxw	***summer frost (gentle slopes):***		•pinegrass cover and vigour increase following canopy opening;
	D:Ep	**Fd**, Sxw	Fd	
	At	***light deficits***		•shrub cover generally sparse.
		----	**Pl, Ep, At**	
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight; •light ground disturbance, which reduces moss cover, should increase establishment of **Fd** natural regeneration under a partial canopy; •**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification likely required if surface not disturbed by logging; restocking of partial cuts may require fill planting; •survival and growth of **Sxw** limited by moisture stress in cleared areas, probably best under partial shade or in small openings.			

IDFdk3 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Fd	***light deficits (vegetation overtop)***		medium; Mixed Shrub - rose
	Pl	**Fd**, **Pl**, Sxw,	**Fd**, **Pl**, Sxw,	
	Sxw	**At**, **Act**, **Ep**	**At**, **Act**, **Ep**	•shrub cover usually increases following canopy removal;
	D:At	***summer frost (gentle slopes)***		•shrubs generally abundant and vigorous, and likely limit tree regeneration.
	Ep	**Fd**, Sxw, Ep	Fd	
	Act	***cold, moist soils (wettest sites)***		
		Fd, Sxw, At, Ep	**Fd**, Sxw, At, Ep	
	•survival and growth of planted **Fd**, **Pl**, and **Sxw** generally adequate to restock cleared sites if vegetation controlled at planting spot; survival and growth of all species will likely be improved by planting on raised microsites; •natural regeneration ingress generally slow due to competition with shrub and herbaceous vegetation; •frost damage may be reduced by planting on raised microsites or under partial canopy or nurse crop; •advance **Sxw** and **Fd** regeneration may contribute significantly to restocking.			
09	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Pl	**Sxw**, **Pl**, **Act**	**Sxw**, **Pl**, **Act**	
	D:Act	***light deficits (vegetation overtop)***		•shrub cover increases somewhat following canopy opening but is limited by cold, wet soils.
		Sxw, **Pl**, **Act**	Sxw, **Pl**, **Act**	
		summer frost		
		Sxw	**Sxw**	
	•survival of planted **Sxw** and **Pl** generally poor except on raised microsites; plantable spots limit planting density; •frost damage to **Sxw** may be reduced by partial tree or shrub canopy but benefits often overwhelmed by cold air accumulation; •Pl uncommon on these sites; mature Pl not well adapted to sites with near-surface water table; •soils very susceptible to rutting and compaction; herbaceous vegetation may be stimulated by surface disturbance; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

IDFdk4 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture systems are currently a form of single tree selection (faller selection) in Fd stands and clearcutting in Pl stands. The selection system in Fd stands is based on an objective for residual basal area, maximum diameter class, diameter class width, and diminuation quotient for diameter classes. Stand regeneration is achieved by release of advance regeneration and natural regeneration ingress. Dense advance regeneration is usually spaced subsequent to logging. In Pl stands with scattered Fd, the Fd are generally not harvested and advance Fd regeneration is protected. Regeneration of Pl stands is primarily by natural regeneration ingress without scarification. There is a trend to regenerate Pl stands by planting.

Advance regeneration in Fd stands is virtually all Fd but is generally not as dense as in the IDFdk3. Density has probably increased somewhat in recent years due to wildfire control, but is slowed by the cold, dry climate. High densities of advance regeneration result in below-ground competition for moisture and nutrients, and may result in growth reductions not only to advance regeneration stems but also to canopy stems. Advance Fd regeneration is generally of good form and vigour, and its growth responds well to canopy opening. Growth generally increases with increasing sunlight, although stems with thin, non-furrowed bark often suffer sunscald when exposed to sunlight after growing in shade. Advance regeneration in Pl stands is generally sparse.

Natural restocking is the normal regeneration method in Fd and Pl stands. Survival of planted Fd on cleared areas has generally been poor due to frequent summer frost and moisture stress.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost is a significant factor reducing initial establishment and growth of planted Fd on cleared areas. Diseases such as Dermea canker can be associated with frost injury on Fd.
Douglas-fir beetle causes frequent mortality of mature Fd, especially those under moisture stress or damaged by logging.
Laminated root rot and Armillaria root disease commonly kill pockets of Fd stems, both mature and immature.

Western spruce budworm can cause severe defoliation in southern portions of IDFdk3; regeneration in partial harvesting systems may experience extreme damage.

Douglas-fir tussock moth occasionally defoliates and kills Fd.

Growth of Pl natural regeneration is commonly reduced by dwarf mistletoe if an inoculum source is present.

Western gall rust and blister rusts are also common on regeneration, and reduce growth.

Pine needle cast disease is very common on Pl regeneration after wet springs and summers and may result in growth reductions.

Mountain pine beetle kills mature Pl trees, especially those under environmental stress, but is less common than in the SBPS Zone.

Squirrels can cause significant damage to plantations during high-population periods.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >50 m wide) group selection systems;

Canopy present for Fd stands includes single tree selection and faller selection systems with up to 60% volume removal as well as low-volume small group selection systems where groups of 2–4 trees are felled. In Pl stands, **canopy present** includes group selections systems with small to medium (25–50 m wide between mature stand edges) harvested groups.

IDFdk4 Site Series - Silviculture Considerations

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>01</td><td>P:Fd</td><td><i>moisture deficits</i></td><td></td><td>low; Pinegrass - kinnikinnick</td></tr>
<tr><td></td><td>Pl</td><td>Fd, Sxw</td><td>Fd, Sxw</td><td></td></tr>
<tr><td></td><td>T:Sxw</td><td><i>summer frost</i></td><td></td><td rowspan="4">•pinegrass cover and vigour generally increase following canopy opening; pinegrass is strong competitor for soil moisture;
•soopollalie may add significant nitrogen to site.</td></tr>
<tr><td></td><td>D:At</td><td>Fd</td><td>Fd</td></tr>
<tr><td></td><td></td><td><i>light deficits</i></td><td></td></tr>
<tr><td></td><td></td><td>----</td><td>Pl, At</td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight;
•excessive opening of Fd stands may result in sunscald and shock to advance Fd regeneration;
•light ground disturbance should increase density of Fd ingress under moderate tree canopy;
•survival of planted Fd in clearings variable and often poor due to moisture stress and frost injury;
•survival of planted Pl moderate to high in sunny or lightly shaded microsites;
•survival and growth of planted Pl and especially Fd may be increased by reduced grass competition and exposed mineral soil;
•Pl natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required but may reduce regeneration delay;
•downed and decaying wood is important as microsites for natural regeneration ingress and for nutrient availability.</td></tr>
<tr><td>02</td><td>P:Fd</td><td><i>moisture deficits</i></td><td></td><td>low; Dry shrub - kinnikinnick</td></tr>
<tr><td></td><td>Pl</td><td>Fd, Pl</td><td>Fd, Pl</td><td></td></tr>
<tr><td></td><td></td><td><i>rooting restrictions (bedrock)</i></td><td></td><td>•vegetation increases little following canopy opening.</td></tr>
<tr><td></td><td colspan="4">•timber productivity low and sites difficult to regenerate following logging;
•Fd natural regeneration ingress following logging generally greatest where residual volume near natural levels;
•survival of planted Fd generally poor; survival of planted Pl poor to moderate if planted in pockets of deeper soil;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

IDFdk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Fd	***moisture deficits*** **Fd** ***nutrient deficits*** Fd ***high surface temperatures***	 **Fd** Fd	low; Dry shrub - kinnikinnick •shrub and herbaceous vegetation increases little following canopy opening.
	•timber productivity very low and sites difficult to reforest following harvesting; •survival of planted **Fd** likely poor but greatest in partial shade (but not in rainshadow) of mature Fd; •**Fd** natural regeneration ingress likely best under near-natural levels of canopy closure; •coarse woody debris is important as microsites for natural regeneration ingress and nutrient availability; •maintenance of soil organic layers and woody debris important for long-term site productivity.			
04	P:Fd Pl	***moisture deficits*** **Fd**, **Pl** ***high surface temperatures***	 **Fd**, **Pl**	low; Dry shrub - kinnikinnick •shrub and herbaceous vegetation increases little following canopy opening.
	•timber productivity very low and sites very difficult to regenerate following harvesting; •survival of planted **Fd** very poor; survival of planted **Pl** expected to be poor to moderate but experience in managing these sites for Pl is very limited; partial shade may increase survival of planted **Pl**; •**Fd** natural regeneration ingress following logging expected to be greatest where residual volume is near natural levels; regeneration occurs primarily in shaded microsites; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

IDFdk4 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>05</td><td>P:Fd</td><td><i>moisture deficits</i></td><td></td><td>low; Pinegrass - bunchgrass</td></tr>
<tr><td></td><td>Pl</td><td>Fd, Pl</td><td>Fd</td><td></td></tr>
<tr><td></td><td>D:At</td><td><i>light deficits</i></td><td></td><td>•grasses are strong competitors with trees seedlings for soil moisture on these sites.</td></tr>
<tr><td></td><td></td><td>----</td><td>Pl, At</td><td></td></tr>
<tr><td></td><td></td><td><i>high surface temperatures</i></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight;
•excessive opening of Fd stands may result in sunscald and shock of advance regeneration;
•survival of planted Fd generally poor on cleared sites and poor to moderate on partial-cut sites, especially if grass competition removed at planting spot; survival and growth of planted Pl likely poor to moderate in full sun or light shade;
•downed and decaying wood important as microsites for natural regeneration ingress and nutrient availability.</td></tr>
<tr><td>06</td><td>P:Pl</td><td><i>moisture deficits</i></td><td></td><td>low; Dry shrub - kinnikinnick</td></tr>
<tr><td></td><td>T:Sxw</td><td>Sxw, At</td><td>Sxw, At</td><td></td></tr>
<tr><td></td><td>D:At</td><td><i>nutrient deficits</i></td><td></td><td>•percent cover of grasses small; shrub and herb vegetation increases little following canopy clearing.</td></tr>
<tr><td></td><td></td><td>Sxw, At</td><td>Sxw, At</td><td></td></tr>
<tr><td></td><td></td><td><i>light deficits</i></td><td></td><td></td></tr>
<tr><td></td><td></td><td>----</td><td>Pl, At</td><td></td></tr>
<tr><td></td><td></td><td><i>summer frost</i></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Sxw</td><td>Sxw</td><td></td></tr>
<tr><td></td><td colspan="4">•natural regeneration of Pl following canopy removal is generally a reliable regeneration option for these sites; drag scarification generally not necessary for restocking but will likely increase ingress rate;
•survival and growth of planted Sxw generally poor except poor to moderate on moist microsites;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

IDFdk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Fd	***moisture deficits***		low; Pinegrass - low forb
	Pl	Fd	Fd	
	D:At	***light deficits***		•pinegrass cover and vigour increases following canopy opening
		----	Pl, At	
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems greatest in full sunlight; •excessive stocking of advance regeneration reduces stand vigour; growth generally improved by thinning of dense patches; •survival of planted **Fd** in clearings highly variable and often poor due to moisture stress (increased by grass competition for moisture) and frost; survival of planted **Pl** generally moderate to high in sunny or lightly shaded microsites; •survival of planted **Fd** and **Pl** in clearings may be increased by site preparation that increases planting site moisture availability and reduces grass competition for moisture; •light ground disturbance may increase **Fd** regeneration ingress under a partial canopy; •surface erosion hazards moderate on steep slopes if surface water is channeled.			
08	P:Pl	***summer frost***		medium; Mixed shrub - scrub birch
	Sxw	Sxw, At	Sxw, At	
	D:At	***light deficits***		•shrub and herb vegetation increases little following canopy clearing.
		Pl, At	Pl, At	
	•**Pl** natural regeneration ingress likely adequate to restock cleared sites if sufficient cones present and well distributed on exposed mineral soil or mixed mineral/organic material; ingress limited by thick soil organic layers on many sites; •survival and growth of planted **Sxw** and natural regeneration ingress of **Sxw** likely poor to moderate due to frequent frost; may be improved under partial canopy; •survival and growth of planted **Pl** likely moderate to high in sunny or lightly shaded microsites			

IDFdk4 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
09	P:Fd	***light deficits (vegetation overtop)***		medium; Mixed Shrub - rose
	Pl	**Fd**, **Pl**, Sxw,	**Fd**, **Pl**, Sxw,	
	Sxw	**At**, **Act**	**At**, **Act**	•shrub and herbaceous vegetation may increase significantly following canopy clearing.
	D:At	***summer frost***		
	Act	**Fd**, Sxw	**Fd**, Sxw	
		cold, moist soils (wettest microsites)		
		Fd, Pl, Sxw, At	**Fd**, Pl, Sxw, At	
	•survival and growth of planted **Fd**, **Pl**, and **Sxw** generally adequate to restock cleared sites if vegetation controlled at planting spot; survival and growth of all species will likely be improved by planting on raised microsites; •natural regeneration ingress generally slow due to competition with shrub and herbaceous vegetation; •frost damage may be reduced by planting on raised microsites or under partial canopy or nurse crop; •advance **Sxw** and **Fd** regeneration may contribute significantly to restocking.			
10	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Pl	**Sxw**, **Pl**, **Act**, **At**	**Sxw**, **Pl**, **Act**, **At**	
	D:Act	***light deficits (vegetation overtop)***		•shrub and herbaceous cover generally increases slightly following canopy clearing.
	At	**Pl**, Sxw, **Act**, **At**	**Pl**, Sxw, **Act**, **At**	
		summer frost		
		Sxw, **At**	**Sxw**, **At**	
	•survival of planted **Sxw** and **Pl** generally poor except on raised microsites; plantable spots limit planting density; •frost damage to **Sxw** may be reduced by partial tree or shrub canopy, but benefits often overwhelmed by cold air accumulation; •**Pl** uncommon on these sites; mature **Pl** not well adapted to sites with near-surface water table; •soils very susceptible to rutting and compaction; herbaceous vegetation may be stimulated by surface disturbance; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

IDFxm Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system Commercial timber harvesting has not been extensive on Crown land in the IDFxm, since much of the area is on steep valley slopes and timber production is relatively low. Where commercial harvesting has occurred on Crown land it has primarily been a faller selection system similar to that in the IDFdk. As in the IDFdk, stand regeneration is primarily by release of advance regeneration and natural regeneration ingress. Plantation success is generally poor. Advance regeneration densities are typically much lower than in the IDFdk3 and spacing is less important. Stocking voids are more common. Salvage of trees killed by Douglas-fir beetle has occurred locally. Harvesting on private land has been primarily diameter-limit harvesting or clearcutting.

Advance regeneration is virtually all Fd but is generally much less dense than in the IDFdk3. These much lower densities are probably the result of the drier climate and resulting drier soils. Advance regeneration densities have probably increased following wildfire control, but only slowly. Due to the drier soils, below-ground competition probably reduces growth at lower stem densities. Advance Fd regeneration is generally of good form and vigour, and its growth responds well to canopy opening. Growth generally increases with increasing sunlight, although stems with thin, non-furrowed bark often suffer sunscald when exposed to sunlight after growing in shade.

Natural restocking is the normal regeneration method in the IDFxm. Survival of planted Fd on cleared areas has generally been poor due primarily to moisture stress.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost is a less significant factor in the IDFxm than in the IDFdk due to the prevalence of steep slopes and the warmer climate. On level terrain, summer frost may significantly limit Fd regeneration in some years.

Douglas-fir beetle causes frequent mortality of mature Fd, especially those under moisture stress or damaged by logging.

Laminated root rot and Armillaria root disease kill pockets of Fd stems, but are less common than in the IDFdk.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and group selection systems with larger harvested groups (generally >50 m wide);

Canopy present for Fd stands includes single tree selection and faller selection systems with up to 60% volume removal as well as low-volume small group selection systems where groups of 2–4 trees are felled. In Pl stands, **canopy present** includes group selection systems with small to medium-size harvested groups (25–50 m wide between mature stand edges).

IDFxm Site Series - Silviculture Considerations

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>01a
Typic
Phase</td><td>P:Fd
D:At</td><td><i>moisture deficits</i>
Fd, At
<i>summer frost (level sites)</i>
Fd</td><td>
Fd, At

Fd</td><td>low; Dry shrub - pinegrass
•pinegrass cover and vigour generally increase following canopy opening;
•pinegrass is strong competitor for soil moisture.</td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is protection and release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; some fill planting may be required to achieve full stocking;
•light ground disturbance generally increases natural regeneration ingress;
•survival of planted Fd variable and often poor, especially on sites without residual tree cover;
•excessive opening of Fd canopy may result in sunscald and shock of advance Fd regeneration;
•survival of planted Fd may be increased by site preparation to increase moisture availability and reduce grass competition;
•maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.</td></tr>
<tr><td>01b
Cold
Phase</td><td>P:Pl
Fd
D:At</td><td><i>moisture deficits</i>
Fd, At
<i>summer frost (level sites)</i>
Fd</td><td>
Fd, At

Fd</td><td>low; Dry shrub - pinegrass
•pinegrass generally increases following canopy opening and is a strong competitor for soil moisture.</td></tr>
<tr><td></td><td colspan="4">same as 01a except:
•natural Pl regeneration usually adequate to restock cleared sites if sufficient cones present and well distributed; scarification generally not required;
•survival of planted Pl on cleared sites generally moderate; in partial cuts, survival and growth likely reduced in shaded microsites;
•Fd natural regeneration ingress and survival of planted Fd generally poor due to frequent summer frost; may be increased somewhat under Pl canopy or nurse crop.</td></tr>
</table>

IDFxm Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd	***moisture deficits***		low; Dry shrub - bunchgrass
		Fd	**Fd**	
		nutrient deficits		•shrub and herbaceous vegetation development on these sites limited by hot, dry soils.
		high surface temperatures		
		(Typic Phase)		
	•timber productivity very low; sites difficult to regenerate; survival of planted trees poor and advance regeneration often sparse; •most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under relatively high levels of Fd canopy closure; •survival and growth of planted **Fd** generally poor due to moisture stress; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
03	P:Pl	***moisture deficits***		low; Dry shrub - kinnikinnick
	Fd	**Fd**	Fd	
		nutrient deficits		•vegetation changes little following tree canopy opening.
		Fd	Fd	
		summer frost		
		Fd	Fd	
		light deficits		
		----	Pl	
	•**Pl** natural regeneration is usually adequate to restock cleared areas if sufficient cones are present and well distributed; seedbed management usually not required; •**Fd** is marginally adapted to these sites; limited by growing-season frost and nutrient and moisture deficits; •survival of planted **Fd** likely poor; survival of planted **Pl** likely moderate to high; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

IDFxm Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd	***moisture deficits***		low; Dry shrub - bunchgrass
		Fd	**Fd**	
		high surface temperatures		
	•timber productivity generally very low; sites very difficult to regenerate following logging due to sparse advance regeneration, slow regeneration ingress, and poor survival of planted trees; •natural regeneration establishment and growth likely best under near-natural canopy levels; •regeneration ingress and advance regeneration typically sparse; growth limited by moisture stress and likely best in light shade; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			
05	P:Fd	***moisture deficits***		low; Pinegrass - low forb
	D:At	Fd	Fd	
		light deficits		
		----	At	
	•most reliable regeneration option for **Fd** is protection and release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; some fill planting may be required to achieve full stocking; •light ground disturbance generally increases natural regeneration ingress under a partial canopy; •survival of planted **Fd** variable and often poor but probably better than on /01a sites; •limitations to survival of planted **Fd** less severe than on /02, /03, or /04; •competition for moisture from grasses less severe than on /01 sites; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			

IDFxm Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>06</td><td>P:Fd
D:At</td><td><i>moisture deficits</i>
Fd
<i>summer frost</i>
<u>Fd</u>
<i>light deficits</i>
----</td><td>

Fd

At</td><td>low; Pinegrass - low forb</td></tr>
<tr><td></td><td colspan="4">•similar to /01a except:
•moisture deficits less limiting and summer frost more limiting to survival and growth of planted Fd;
•experience indicates that survival and early growth of planted Pl may be moderate on cleared areas; growth to maturity uncertain, since Pl is generally absent from natural stands.</td></tr>
<tr><td>07</td><td>P:Fd
D:At
Ep</td><td><i>summer frost</i>
Fd
<i>light deficits</i>

<i>moisture deficits</i></td><td>

Fd, At, Ep</td><td>medium; Mixed shrub - grass

•shrub cover and vigour increases somewhat following canopy removal but is usually not a major limitation to prompt reforestation.</td></tr>
<tr><td></td><td colspan="4">•partial harvesting with light surface disturbance to increase regeneration ingress is likely a suitable option for these sites;
•advance Fd regeneration is generally sparse but can contribute to regeneration stocking;
•Sxw advance regeneration is often present; growth is generally slow but evidence indicates that Sxw may form crop tree on wettest sites if protected in partial-cut systems;
•survival of planted Fd generally greater than on /01a sites and may be sufficient for reforestation of partially harvested sites;
•summer frost damage to Fd likely low under partial canopy of Fd or deciduous trees;
•sites susceptible to soil compaction and rutting.</td></tr>
</table>

IDFxm Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Fd	***light deficits (vegetation overtop)***		medium; Mixed shrub - rose
	Sxw	**Fd**, Sxw, **Act**, **At**	**Fd**, Sxw, **Act**, **At**	
	D:Act	***summer frost***		
	At	**Fd**, Sxw	Fd	
	•prompt planting of **Sxw** and **Fd** under a partial tree canopy with control of competing vegetation at planting spot should restock these sites; growth rates of **Sxw** may be limited by frost in some years and by moisture stress in dry years; •natural **Sxw** and **Fd** regeneration ingress generally slow, limited by competing shrub and herbaceous vegetation; •advance **Sxw** and **Fd** regeneration can generally contribute to regeneration stocking; •experience indicates that **Pl** can be successfully established on these sites; **Pl** not present in most natural stands; •soils are very sensitive to rutting and compaction during growing season.			
09	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	Pl	Sxw, Pl, At	Sxw, Pl, At	
	D:At	***light deficits (vegetation overtop)***		•shrub and tall herbaceous vegetation cover increases following canopy removal.
	Act	Sxw, **Pl**, **At**, **Act**	Sxw, **Pl**, **At**, **Act**	
		summer frost		
		Sxw, Act, At	----	
	•survival and growth of planted **Sxw** on all sites and **Pl** on cleared sites generally adequate to restock sites if planted on relatively dry microsites with spot vegetation control; •natural regeneration of **Pl** and **Sxw** on cleared sites is slow, limited by competing vegetation and thick soil organic layers; •risk of summer frost damage to **Sxw** may be somewhat reduced by planting under partial tree or shrub canopy; •soils very susceptible to rutting, puddling, and compaction.			

SILVICULTURE CONSIDERATIONS

IDFxw Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in Fd stands on Crown land is currently a faller selection system similar to that in the IDFdk. Stand regeneration is primarily by release of advance regeneration and natural regeneration ingress. Plantation success is generally poor. Salvage of trees killed by Douglas-fir beetle has occurred locally. Harvesting on private land has been primarily diameter-limit harvesting or clearcutting. Percent volume removal in Py stands has been relatively high.

Advance regeneration is primarily Fd with some Py (especially on drier sites), but is generally much less dense than in the IDFdk, probably as a result of the drier climate and resulting drier soils. Due to the drier soils, below-ground competition probably reduces growth at lower stem densities. Advance Fd regeneration is generally of good form and vigour, and its growth responds well to canopy opening. Growth generally increases with increasing sunlight, although stems with thin, non-furrowed bark often suffer sunscald when exposed to sunlight after growing in shade.

Natural restocking is the normal regeneration method in the IDFxm. Survival of planted Fd on cleared areas has generally been poor due primarily to moisture stress.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost may limit Fd regeneration on some level terrain at the base of slopes but is generally less severe than in the IDFdk.
Douglas-fir beetle causes frequent mortality of mature Fd, especially those under moisture stress or damaged by logging.
Mountain pine beetle has caused local mortality of mature Py trees.
Western spruce budworm has caused widespread defoliation of Fd.
Laminated root rot and Armillaria root disease kill pockets of Fd stems but are generally less common than in the IDFdk.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger group (generally >50 m wide) selection systems;

Canopy present includes single tree selection and faller selection systems with up to 60% volume removal as well as low-volume small group selection systems where groups of 2–4 trees are felled.

IDFxw Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd Py D:At	***moisture deficits*** **Fd**, Py, At	 Fd	low to medium; Pinegrass - bunchgrass •pinegrass cover and vigour generally increases following canopy opening; •pinegrass is strong competitor for soil moisture.
	•most reliable regeneration option for **Fd** and **Py** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; •advance **Fd** and **Py** regeneration is sparse in many stands; •**Fd** natural regeneration ingress is slow and establishes primarily in shaded microsites but not beneath larger trees; •survival in clearings of planted **Fd** generally poor, and **Py** likely poor to moderate; limited primarily by moisture deficits and competition with grasses; •**At** stems mostly small, and growth relatively slow; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			
02	P:Fd Py	***moisture deficits*** **Fd**, **Py** ***nutrient deficits (shallow soils)*** ***rooting restrictions (bedrock)***	 **Fd**, **Py**	low; Pinegrass - bunchgrass
	•timber productivity very low and stands very difficult to regenerate due to sparse advance regeneration, slow regeneration ingress, and poor plantation survival; •natural regeneration ingress by **Fd** and **Py** slow, and likely best under near-natural canopy levels; •little experience in managing these sites for **Py**; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

IDFxw Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>03</td><td>P:Fd
Py</td><td><i>moisture deficits</i>
Fd, Py
<i>high surface temperatures</i></td><td>
Fd, Py</td><td>low; Dry shrub - bunchgrass
•grasses effective competitors for soil moisture.</td></tr>
<tr><td></td><td colspan="4">•very low timber productivity due to very dry soils; tree canopy typically open and advance regeneration usually sparse;
•extremely difficult to regenerate (sparse advance regeneration, limited regeneration ingress, and poor plantation survival);
•natural regeneration ingress of Fd and Py slow, but likely best under near-natural canopy levels;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>04</td><td>P:Fd
Py
D:At</td><td><i>moisture deficits</i>
Fd, Py, At</td><td>
Fd, Py, At</td><td>low; Dry shrub - bunchgrass
•grasses are effective competitors for soil moisture.</td></tr>
<tr><td></td><td colspan="4">•very low timber productivity, and stands very difficult to regenerate;
•survival of planted Fd very poor; only reliable regeneration option is release of advance regeneration and natural regeneration ingress under near-natural canopy levels; advance regeneration is often sparse;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>05</td><td>P:Fd
D:At</td><td><i>moisture deficits</i>
Fd, At</td><td>
Fd</td><td>low; Pinegrass - low forb
•grasses less abundant that in /03 or /04 units but increase following canopy removal.</td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; survival of planted Fd likely poor;
•competition for moisture from grasses less severe than on /01 sites;
•although Pl does not occur naturally on these sites, experience suggests that Pl plantations can be initially established;
•maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.</td></tr>
</table>

IDFxw Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd	***light deficits (vegetation overtop)***		medium; Mixed shrub - tall shrub
	Sxw	Fd, **Act**, **At**, **Ep**	Fd, **Act**, **At**, **Ep**	
	D:Act, At	***summer frost (toe slopes)***		•shrubs and tall herbs relatively abundant and usually increase following tree canopy clearing.
	Ep	Fd	----	
	•survival of planted **Sxw** and **Fd** on cleared areas generally moderate to high if vegetation is controlled or not abundant at planting spot; growth of **Sxw** generally slow, especially on driest parts of site series and in dry years; •frost may limit growth of **Fd** in some years on level sites; •soils very susceptible to compaction and surface erosion.			
07	P:Sxw	***light deficits (vegetation overtop)***		medium to high; Mixed shrub - rose
	Fd	Sxw, Fd, **Act**,	Sxw, Fd **Act**,	
	D:Act	**At**, **Ep**	**At**, **Ep**	•shrub and herbaceous vegetation may increase significantly following canopy opening.
	At	***summer frost***		
	Ep	Fd	----	
		cold, moist soils (depressions)		
		Fd	Fd	
	•survival and growth of **Sxw** and **Fd** generally adequate to restock sites if planted promptly; vegetation control will likely improve early growth of **Sxw** and especially **Fd**; •survival and growth of **Sxw** and **Fd** best on relatively warm, moist, but not wet microsites; •natural regeneration ingress generally slow and limited by competing vegetation; •soils are very susceptible to compaction and rutting; •**Sxw** with large, dense crowns exposed to winds by logging are very suceptible to windthrow on these sites.			

MSxv Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system is even-aged management (clearcutting) and the predominant regeneration method has been natural regeneration, using drag scarification to create a more favourable seedbed and cone distribution. Regeneration ingress has generally been much slower and more sparse than in the SBPS, due probably to the colder climate and more frequent summer frosts. Fill planting is often required. Natural regeneration success in recent years has been moderately high, although the time required to achieve full stocking is generally longer than in the SBPS. Regeneration ingress rates seem to be generally slower in the Itcha–Ilgachuz area than in other portions of the MSxv. In recent years, drag scarification has been used less frequently for Pl seedbed management, since it may not contribute significantly towards meeting restocking objectives. In addition, an increasing number of harvested sites have been planted with Pl due to greater control on stocking distribution and shortened regeneration delay. Disc trenching has been used on some sites to create a more favourable planting spot for Pl. Wet sites have been planted with Sxw, often on artificially created mounds.

Partial harvest systems experience is very limited. A research trial near Satah Mountain is assessing natural regeneration in a group selection system with small to medium (20–40 m wide) harvested groups on mesic sites. Preliminary results indicate that openings of this size will regenerate naturally with Pl.

Advance regeneration in Pl stands is primarily Pl and Sxw, but is typically sparse and would contribute little to restocking. Height growth response of advance Pl regeneration to canopy opening is generally small.

Principal Insect, Disease, and Abiotic Damage Concerns

Growing-season frost is a principal factor affecting regeneration success. High mortality rates have been recorded in some Pl plantations and frost-damaged natural regeneration ingress is common, especially on lower slopes.

Dwarf mistletoe and stem rusts are present but generally much less common than in the SBPS.

Mountain pine beetle is endemic and a principal agent of mortality in mature trees, but the incidence of mortality is less extensive than in the SBPS.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and group selection systems with harvested groups generally >60 m wide;

Canopy present for most sites refers to group selection systems with small to medium-size (generally 25–60 m wide) harvested patches; does not include single tree selection systems; **canopy present** for wet spruce sites (/08 and /09) refers to single tree selection or small group selection.

MSxv Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Pl	***moisture deficits***		low; Dry shrub - dwarf ericaceous shrub
	Sxw	Sxw, Bl	Sxw, Bl	
	T:Bl	***summer frost (level sites)***		•significant decrease in moss cover and increase in grasses and forbs following canopy removal.
		Sxw, **Bl**	Sxw, Bl	
		summer frost (slopes)		
		Sxw, Bl	----	
	•natural **Pl** regeneration ingress generally adequate to restock cleared sites if sufficient cones are present and well distributed; •**Pl** natural regeneration often patchy, likely due to harvesting effects on cone distribution; •scarification generally not required for restocking but will likely increase ingress rate if conducted very soon after logging; •**Pl** plantations are successfully used to restock cleared areas; growth likely reduced in shaded microsites of partial cuts; •growth of planted **Pl** and **Sxw** improved by site preparation that increases available moisture and exposes mineral soil; •height growth response of advance **Pl** regeneration to canopy removal is generally slow; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
02	P:Pl	***summer frost***		low; Dry shrub - dwarf ericaceous shrub
		Pl	Pl	
		moisture deficits		•a unique vegetation dominated by Altai fescue and lichens.
		nutrient deficits		
	•these sites apparently near limits of **Pl** seedling tolerance of summer frost and moisture stress; often adjacent to grasslands that are maintained at least partially by frost; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration; •no silviculture experience with these sites; summer frost may limit **Pl** regeneration.			

MSxv Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Pl	***moisture deficits*** ***nutrient deficits*** ***(Shallow Phase)*** ***rooting restrictions*** ***(Shallow Phase)***		low; Dry shrub - dwarf ericaceous shrub •shrub and herbaceous vegetation cover increases little following canopy removal; limited by moisture deficits.
	•natural **Pl** regeneration ingress usually sufficient to restock cleared and partial-cut sites if adequate numbers of cones are present and well distributed; scarification generally not required for seedbed management; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
04	P:Pl Sxw T:Bl	***summer frost (gentle slopes)*** Sxw, **Bl** ***moisture deficits*** Sxw, **Bl** ***nutrient deficits (coarse sands)***	 Sxw, Bl Sxw, Bl	low; Dry shrub - dwarf ericaceous shrub
	•natural **Pl** regeneration ingress usually adequate to restock cleared sites if sufficient cones are present and well distributed; scarification generally not required for restocking, but may increase ingress rate; •natural **Pl** regeneration often patchy due partly to harvesting effects on cone distribution; fill planting may be required; •survival and growth of planted **Pl** generally adequate to restock sites without vegetation control; •survival and growth of planted **Sxw** generally poor but best in relatively moist microsites and on cool aspects; •risk of frost damage increases on gentle slopes and lower to toe slope positions.			

MSxv Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Pl	***summer frost (level sites)***		low to medium; Dry shrub - trapper's tea
	Sxw	**Sxw**, **Bl**	Sxw, Bl	
	T:Bl	***summer frost (slopes)***		•forest canopy removal generally results in little change in cover of trapper's tea.
		Sxw, Bl	Sxw, Bl	
		light deficits		
		----	Pl	

•natural **Pl** regeneration ingress usually sufficient to restock cleared sites if adequate cones are present and well distributed; scarification likely not required to restock most cleared sites but will increase ingress rate; ingress rates may be slow in shaded microsites of partial cuts;

•natural **Pl** regeneration ingress often patchy due partly to differences in microsite and vegetation, as well as harvesting effects on cone distribution; fill planting may be required to achieve full stocking on some sites;

•survival and growth of planted **Pl** general sufficient to restock cleared sites; vegetation control generally not required;

•survival and growth of planted **Sxw** likely moderate;

•**Bl** commonly present in understory, but absent or infrequent in natural forest canopy.

MSxv Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Pl	***summer frost***		medium; Dry shrub - dwarf ericaceous shrub
	Sxw	Pl, **Sxw**, **Bl**	Sxw, Bl	
	T:Bl	***cold, moist soils***		•forest canopy removal results generally in moderate increases in shrub and forb cover.
		Sxw, Bl	Sxw, Bl	
		light deficits (vegetation overtop)		
		----	**Pl**	

•natural **Pl** regeneration ingress generally sufficient to restock sites if adequate numbers of cones are present and well distributed, except on wettest sites and microsites where thick forest floor may limit establishment;
•survival and growth of planted **Pl** expected to be generally moderate on cleared areas and low to moderate on partial cuts; vegetation control not considered essential for restocking but will likely improve growth;
•survival and growth of planted **Sxw** limited by frequent summer frost and cold soils, especially on level sites;
•soils are susceptible to compaction and rutting.

MSxv Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Pl Sxw T:Bl	***summer frost*** Pl, **Sxw**, **Bl** ***cold, wet soils*** Pl, Sxw, Bl	 Pl, **Sxw**, Bl Pl, Sxw, Bl	low to medium; Mixed shrub - scrub birch
	•natural **Pl** regeneration limited by thick forest floor, cold wet mineral soils, and insufficient cones on some sites; •sites have very high risk of summer frost damage; frost damage may be reduced somewhat under a partial canopy; •survival and growth of planted **Pl** and **Sxw** generally poor to moderate and best on elevated microsites (natural or artificial); •some **Sxw** natural regeneration ingress anticipated on exposed mineral soil in cleared and partial-cut sites; •soils generally susceptible to compaction, rutting, and puddling.			
08	P:Sxw S:Pl T:Bl	***summer frost*** **Sxw**, Pl, **Bl** ***cold, wet soils*** Sxw, Pl, Bl ***light deficits*** ----	 **Sxw**, Pl, **Bl** Sxw, Pl, Bl Pl	low to medium; Mixed shrub - wet forb •forest canopy removal generally results in only moderate increases in shrub cover.
	•survival and growth of **Sxw** and **Pl** generally poor except on elevated microsites (natural or artificial); •summer frost damage may be somewhat reduced by a partial canopy of trees or shrubs, but benefits often overwhelmed by accumulation of cold air from upslope areas; •**Pl** seldom present; growth limited by cold, wet soils; •**Pl** natural regeneration generally not a reliable reforestation option due to cold, thick soil organic layers and insufficient cones.			

MSxv Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
09	P:Sxw T:Pl Bl	***summer frost*** Sxw, Pl, **Bl** ***cold, wet soils*** Sxw, **Pl**, **Bl**	Sxw, Pl, **Bl** Sxw, **Pl**, **Bl**	low to medium; Mixed shrub - wet forb •forest canopy removal generally results in only moderate increases in shrub cover.
	•productivity for trees very low, and sites extremely difficult to restock; •summer frost extremely limiting to all tree species and generally not affected by partial canopy retention; •rate of natural regeneration ingress very slow.			

SBPSdc Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system is currently even-aged management (clearcutting), and the principal regeneration strategy has been natural regeneration. Drag scarification has been used on many, but not all, winter-logged blocks to improve seedbed characteristics and cone distribution. Pl cones are typically serotinous and apparently have a high proportion (>75%) of viable seed when closed. Natural regeneration success has generally been high, although regeneration is often patchy, including dense patches and small stocking voids. Patchiness may be at least partially related to felling and bunching practices. In recent years there has been less use of drag scarification, since it may not contribute significantly to restocking, does little to improve regeneration distribution, and may increase the risk of overly dense stands. In addition, there has been a significant increase in recent years in the use of Pl artificial regeneration (planting) due to its greater stocking distribution control and shorter regeneration delay. Control of pinegrass competition is considered essential by many, and disc trenching has often been used for this purpose. Wet sites are typically planted with Sxw, often on prepared mounds.

Partial harvest systems experience is very limited. Observations of natural openings created by insects, diseases, or wind suggest that harvested openings larger than about 25 m wide on mesic sites will naturally restock with Pl. North of 52°45', in the Tibbles–Nazko area, Sb commonly establishes in natural openings.

Advance regeneration in Pl stands is primarily Pl and Sxw, but is typically sparse and would contribute little to restocking.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost may damage Sxw and some Pl plantations in some years, especially on lower slopes.
Dwarf mistletoe is very common in regenerating stands if a seed source is present on taller stems. It can cause significant growth reductions.
Root collar weevil often affects a few stems in regenerating stands.
Gall rust and blister rust affect a few stems in many regenerating stands and are locally severe.

SILVICULTURE CONSIDERATIONS

Mountain pine beetle is a principal agent of mortality in mature stems. The incidence of mortality is often high, but mortality is less extensive than in the SBPSxc where the climate is drier.
Atropellis canker affects the timber value of mature stems, especially in dense stands.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >50 m wide) group selection systems;

Canopy present refers primarily to group selection systems with small to moderate-size (generally 25–50 m wide) harvested patches; does not include single tree selection systems except in wet spruce types (site series /07 and /08).

SBPSdc Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Pl	***moisture deficits***		most common: medium; Pinegrass - kinnikinnick
	Sxw	**Sxw**, **Sb**	Sxw, Sb	less common: medium; Dry alder - pinegrass (higher elevations)
	T:Sb(northern areas)	***summer frost***		
		Sxw	----	
	D:At	***light deficits***		•pinegrass cover increases following tree canopy removal;
		----	Pl, At	•pinegrass is a strong competitor for soil moisture;
				•retention of soopolallie and decaying wood increases potential soil nitrogen additions.

- •**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed;
- •scarification generally not required for **Pl** natural restocking of clearcuts but may increase early ingress rate; scarification may be required in shaded microsites of partial cuts if soil organic layers are not adequately disturbed or mineralized; growth of natural regeneration may also be reduced in shaded microsites;
- •natural regeneration ingress often patchy; may be partly due to harvest method and microsite variability;
- •survival and growth of planted **Pl** generally sufficient to restock cutover areas if pinegrass abundance is controlled or naturally low; if pinegrass is dense, reduction of pinegrass at planting spot is likely required for prompt restocking;
- •growth and survival of planted **Pl** will be reduced in shaded microsites of partial-cut areas;
- •survival and growth of planted **Sxw** low to moderate and generally greatest in moist microsites;
- •frost damage to **Sxw** may be reduced under partial canopy or nurse crop, or as part of Pl-dominated mixture;
- •**Sb** growth very slow and Sb seldom present in codominant canopy layer; occurs north of 52° 45';
- •maintenance of soil organic layers and woody debris important for long-term nutrient availability and natural regeneration.

SBPSdc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02a Typic Phase	P:Pl D:At	***moisture deficits*** Pl, At ***nutrient deficits***	Pl, At	low; Dry shrub - kinnikinnick •shrub and herb vegetation increases little following canopy clearing; •soopolallie and decaying wood add nitrogen to site.
	•site series /01 comments regarding **Pl** natural regeneration generally apply; •productivity for trees low; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
02b: Shallow Phase	P:Pl D:At	***moisture deficits*** Pl, At ***nutrient deficits (rooting restrictions)***	Pl, At	low; Dry shrub - kinnikinnick •shrub and herb vegetation increases little following canopy clearing; •retention of soopolallie and decaying wood increases potential soil nitrogen additions.
	•**Pl** natural regeneration usually adequate to restock all sites if sufficient numbers of cones present and well distributed; •densities of natural regeneration ingress generally less than on /01 sites and limited by shallow, rocky soils; •productivity for trees low, due to moisture and nutrient deficits; •planting sites limited by shallow, rocky soils; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

SBPSdc Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>03a
Typic
Phase</td><td>P:Pl
T:Sxw
Sb(north)
D:At</td><td><i>moisture deficits</i>
Sxw, Sb, At
<i>summer frost (gentle slopes)</i>
Sxw
<i>light deficits</i>
----</td><td>
Sxw, Sb, At

Sxw

Pl, At</td><td>low; Dry shrub - kinnikinnick

•pinegrass is strong competitor for soil moisture;
•retention of soopolallie and decaying wood increases potential soil nitrogen additions.</td></tr>
<tr><td></td><td colspan="4">•natural Pl regeneration comments under /01 site series generally apply;
•survival and growth of planted Sxw and Sb likely poor, except moderate on moist microsites;
•advance Sb regeneration when present usually of poor form and slow growing; timber value of Sb low;
•survival and growth of planted Pl generally sufficient to restock cutover areas if pinegrass abundance is controlled or naturally low; if pinegrass is dense, site preparation is likely required for prompt restocking;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>03b
Sand
Phase</td><td>P:Pl
T:Sxw
Sb(north)
D:At</td><td><i>moisture deficits</i>
Sxw, Sb, At
<i>summer frost (gentle slopes)</i>
Sxw
<i>light deficits</i>
<i>nutrient deficits</i></td><td>
Sxw, Sb, At

Sxw</td><td>low; Dry shrub - kinnikinnick

•pinegrass can be strong competitor for soil moisture;
•retention of soopolallie and decaying wood increases potential soil nitrogen additions.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration usually adequate to restock sites if sufficient numbers of cones present and well distributed; scarification generally not required but may increase early ingress rate; establishment and growth may be reduced in shaded microsites of partial cuts;
•survival and growth of Sxw low to moderate, and best in relatively moist microsites where pinegrass cover has been reduced;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

SBPSdc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Pl	***summer frost***		medium; Pinegrass - low forb
	Sxw	Sxw	Sxw	
	T:Sb(north)	***cold, moist soils***		•vegetation changes relatively little following tree canopy opening.
	D:At	Sxw, At	Sxw, At	
		light deficits		
		----	Pl, At	

•**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed;

•scarification generally not required for **Pl** natural restocking of clearcuts but may increase ingress rate; scarification or fill planting may be required in shaded microsites of partial cuts if soil organic layers are not adequately disturbed or mineralized; growth of natural regeneration may also be reduced in shaded microsites;

•survival and growth of planted **Pl** expected to be sufficient to restock sites, but growth likely improved on exposed mineral soil or raised microsites;

•frost damage to **Sxw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture;

•advance **Sxw** regeneration may contribute significantly to restocking; **Sb** generally has poor form and slow growth;

•soils are susceptible to compaction, rutting, and puddling.

SBPSdc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Pl	***summer frost***		medium; Mixed shrub - scrub birch
	Sxw	Sxw	Sxw	
	T:Sb	***cold, moist soils***		•forest canopy removal generally results in small increase in shrub cover.
	(northern areas)	Sxw, At	Sxw, At	
		light deficits		
	D:At	----	Pl, At	

•survival and growth of planted **Pl** moderate to high if planted on raised microsites with full sunlight, and poor to moderate on cool, shaded microsites;
•survival and early growth of planted **Sxw** likely moderate on raised microsites, and poor on colder microsites;
•vegetation management generally not required for survival of planted trees but may improve growth;
•natural **Pl** regeneration ingress generally not reliable option due to insufficient seed and thick soil organic layers;
•frost damage to **Sxw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture; benefits may be overwhelmed by cold air accumulation if large upslope cold air source is present.

SBPSdc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Pl	***light deficits (vegetation overtop)***		medium; Mixed shrub - moist shrub
	Sxw	**all species**	**all species**	
	T:Sb(north)	***summer frost***		•forest canopy removal generally results in moderate increases in shrub cover.
	D:Act	**Sxw**	Sxw	
	At	***cold, wet soils***		
		Pl, Sxw, At	Pl, Sxw, At	

•survival and early growth of planted **Sxw** and **Pl** generally adequate to restock cleared sites if planted on raised microsites, and if vegetation is controlled at planting spot;
•natural regeneration of **Pl** generally not an option due to insufficient seed and thick soil organic layers;
•natural regeneration of **Sxw** may restock small patch cuts with exposed mineral soil, especially when seed rain is high;
•summer frost risk and effects of cold soils greatest where this type occurs on low-gradient floodplains;
•frost damage to **Sxw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture.

SBPSdc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Pl	Sxw, **Pl**, **Sb**	Sxw, **Pl**, **Sb**	
	T:Sb(north)	***summer frost***		•forest canopy removal generally results in small to moderate increases in shrub cover.
		Sxw, Pl, Sb	Sxw, Pl, Sb	
		light deficits (vegetation overtop)		
		Pl	Pl	
	•timber productivity very low and stands difficult to regenerate after logging; •survival and growth of planted **Sxw** and **Pl** generally poor except moderate on elevated microsites (natural or artificial); •survival of **Sb** on raised microsites likely moderate, but growth slow; •attempts to reduce frost damage by maintaining partial canopy likely overwhelmed by accumulation of cold air; •mechanical disturbance of soil surface may increase vigour and cover of shrub and herbaceous vegetation; •soils are very susceptible to rutting when not frozen.			
08	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Pl	Sxw, **Pl**, Sb, Act	Sxw, **Pl**, Sb, Act	
	T:Sb (north)	***summer frost***		•forest canopy removal generally results in moderate increases in shrub cover;
	D:Act	Sxw, Pl, Sb	Sxw	
		light deficits (vegetation overtop)		•growth of shrub and herbaceous vegetation limited by cold, wet soils.
		Pl, Act	**Pl**, **Act**	
	•survival and growth of planted **Sxw** and **Pl** generally poor, except moderate on elevated microsites (natural or artificial); •attempts to reduce frost damage by maintaining partial canopy likely overwhelmed by accumulation of cold air; •mechanical disturbance of soil surface may increase vigour and cover of shrub and herbaceous vegetation; •soils are very susceptible to rutting and puddling when not frozen.			

SBPSmk Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system is currently even-aged management (clearcutting) with natural Pl regeneration and no site preparation. Drag scarification has generally not been used to prepare a seedbed for natural Pl regeneration except in northern parts of the subzone. Even in northern areas, however, use of drag scarification is decreasing since it may not contribute significantly to restocking, does little to improve regeneration distribution, and may increase the risk of high-density stands. Pl cones are typically serotinous and apparently have a high proportion (>75%) of viable seed when closed. Success of natural regeneration has generally been high. There has been an increase in recent years in the use of Pl artificial regeneration (planting) due to its greater stocking distribution control and shorter regeneration delay. Control of pinegrass competition is considered essential by many for plantation success, and disc trenching has often been used for this purpose. Wet sites are typically planted with Sxw, often on prepared mounds. Single tree selection systems have been used for Douglas-fir stands on south aspects. Regeneration in these stands is by release of advance regeneration and ingress of natural Fd regeneration.

Principal crop tree species are Pl and Sxw. Fd and Sb occur at lower elevations, with Sb mostly north of 53°. Growth of Sb is slow, and it has low timber value. Bl occurs on wetter sites but is seldom in the canopy and is not a reliable crop tree species due to high mortality and incidence of heart rot. Deciduous stands are common in the southern half of the subzone.

Partial harvest systems experience is common in Fd stands but essentially nonexistent in Pl stands, with the exception of retention of scattered Fd trees. Silviculture systems for Fd stands at present are primarily single tree selection (faller selection).

Advance regeneration in Pl stands is primarily Pl and Sxw, but is generally very sparse and would contribute little to restocking. Fd advance regeneration is common in Fd stands on steep south-facing slopes. The advance regeneration in these stands is managed as in the IDFdk3.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost may damage Fd and Sxw in some years, especially on lower slopes.
Dwarf mistletoe is common in regenerating Pl stands if a seed source is present on taller stems. It can cause significant growth reductions.
Root collar weevil, gall rust, and blister rust affect a few stems in many regenerating stands and can be locally severe.
Mountain pine beetle is a principal agent of mortality in mature stems but the incidence of mortality is generally much less extensive than in the SBPSxc where the climate is drier and trees are more stressed.
Atropellis canker affects the timber value of many mature stems, especially in dense stands.
Douglas-fir beetle is a principal agent of mortality of large Fd trees.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >50 m wide) group selection systems;

Canopy present for Pl stands and many Sxw stands refers to group selection systems with small and moderate-size (generally 25–50 m wide) harvested patches, **canopy present** for Fd stands (especially site series /03) and for wet Sxw stands (site series /07 and /08) refers to low- to moderate-volume removal single tree selection systems or very small (few trees) group selection systems.

SBPSmk Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Pl	***moisture deficits***		most common: medium; Pinegrass - low forb
	Sxw	Sxw	----	less common: medium; Dry alder - pinegrass (higher elevations)
	Fd (low elevations)	***summer frost (gentle slopes)***		
		Sxw, **Fd**	Fd	
	D:At	***light deficits***		•retention of soopolallie and decaying wood increases potential soil nitrogen additions;
		----	Pl, At	•pinegrass and shrub cover increase somewhat after harvesting; •pinegrass is strong competitor for soil moisture.

- •**Pl** natural regeneration usually adequate to restock cleared sites if sufficient cones present and well distributed;
- •scarification generally not required for **Pl** natural restocking of clearcuts but may increase ingress rate; scarification may be required in shaded microsites of partial cuts if soil organic layers are not adequately disturbed or mineralized; growth of natural regeneration may also be reduced in shaded microsites;
- •natural regeneration ingress often patchy; may be partly due to harvest method;
- •survival and growth of planted **Pl** generally high and **Sxw** moderate to high if pinegrass abundance at planting site is low;
- •planted **Fd** (low elevations only) survival often poor on gentle slopes but likely better on steeper slopes or under partial tree canopy; growth of established individual **Fd** stems best in full sunlight;
- •frost hazard greatest on gentle slopes and lower slope positions;
- •**Fd** survival likely poor at elevations above its natural local distribution;
- •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration;
- •sites susceptible to compaction and rutting following snowmelt; soils on low-relief terrain generally remain moist well into growing season.

SBPSmk Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>02</td><td>P:Pl
Fd (low elevations)
T: Sxw</td><td><i>moisture deficits</i>
Fd, Sxw
<i>nutrient deficits</i>
<i>rooting restrictions</i></td><td>Fd, Sxw</td><td>low; Dry shrub - kinnikinnick
•vegetation development variable depending on microsite soil depth.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration usually adequate to restock all sites if sufficient numbers of cones present and well distributed; scarification generally not required;
•densities of natural regeneration ingress generally less than on /01 sites and limited by shallow, rocky soils;
•survival and growth of planted Pl generally adequate to restock cutover areas; planting spots limited by shallow, rocky soils;
•survival of planted Fd likely poor in clearings and moderate under partial Pl or Fd canopy;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>03</td><td>P:Fd
Pl
D:At</td><td><i>moisture deficits</i>
Fd, At</td><td>Fd</td><td>medium; Pinegrass - kinnikinnick
•retention of soopolallie and decaying wood increases potential soil nitrogen additions;
•pinegrass cover often vigorous; competes effectively with tree seedlings for soil moisture.</td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; downed and decaying wood may be important as microsites for natural regeneration ingress;
•Pl natural regeneration options often limited by insufficient Pl canopy trees and cones;
•survival and growth of planted Fd likely poor and Pl likely moderate in cleared and partial-cut areas; Pl growth will be reduced in shaded microsites;
•sites susceptible to surface soil erosion following channelization of snowmelt and heavy rains;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

SBPSmk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04a Typic Phase	P:Pl Fd Sxw T:Sb D:At	***moisture deficits*** **Sxw**, **Sb** ***summer frost*** **Fd** ***light deficits*** ----	 Sxw, Sb Fd Pl, At	medium; Pinegrass - kinnikinnick •soopolallie adds nitrogen to site; •pinegrass cover often vigorous; competes effectively with tree seedlings for soil moisture.

- •**Pl** natural regeneration is usually adequate to restock cleared sites if sufficient cones present and well distributed; scarification generally not required but may increase early ingress rate; ingress may be reduced in shaded microsites of partial cuts especially if soil organic layers are not disturbed or not adequately mineralized;
- •survival and growth of planted **Pl** generally sufficient to restock cutover areas if pinegrass densities low; if pinegrass abundant then mechanical site preparation to reduce pinegrass competition may be required; growth likely reduced in shaded microsites of partial cuts;
- •planted **Fd** survival generally poor except on slopes; risk of poor **Fd** survival increases above its natural local elevation limits;
- •survival and growth of planted **Sxw** generally poor, except in moist microsites such as depressions and shaded areas.

Site series	Ecologically adapted tree species	No or limited canopy	Canopy present	Vegetation potential and complex
04b Sand Phase	P:Pl Sxw Fd T:Sb D:At	***moisture deficits*** **Sxw**, **Fd**, **Sb**, At ***summer frost*** Sxw, **Fd** ***nutrient deficits*** Sxw, Fd	 Sxw, Sb, Fd, At Fd Sxw, FD	low; Pinegrass - kinnikinnick •retention of soopolallie and decaying wood increases potential soil nitrogen additions; •kinnikinnick usually abundant; •pinegrass competes with tree seedlings for moisture and nutrients.

- •comments under /04a generally apply;
- •**At** may improve long-term nutrient availability and productivity of these sites;
- •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.

SBPSmk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Pl Fd Sxw D:At	***moisture deficits*** Sxw, Fd ***light deficits*** ----	 Sxw Pl, At	most common: low; Pinegrass - low forb less common: medium; Dry alder - pinegrass (mostly at higher elevations) •pinegrass cover often vigorous; competes effectively with tree seedlings for soil moisture.
	•**Pl** natural regeneration usually adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required but will likely increase early ingress rate; •survival and growth of planted **Pl** generally sufficient to restock cutover areas if pinegrass densities low; if pinegrass abundant then mechanical site preparation to reduce pinegrass competition generally required for successful plantations; •survival of planted **Sxw** probably moderate to high, but initial growth relatively slow; •survival and growth of planted **Fd** likely poor; suitable option for **Fd** is group selection with natural regeneration; •sites are susceptible to surface erosion following rutting and other disturbances to forest floor and vegetation.			
06	P:Pl Sxw D:Act At	***summer frost*** Sxw ***cold, moist soils*** Pl, Sxw, At ***light deficits (vegetation overtop)*** Pl, Act, At	 Sxw Pl, Sxw, At **Pl, Act, At**	medium; Mixed shrub - moist shrub •shrub and pinegrass cover usually increase somewhat following forest canopy removal; •vegetation competition has a moderate impact on reforestation success.
	•natural **Pl** regeneration not a reliable option due to thick organic layers, cold soils and competing vegetation; •survival of planted **Pl** and **Sxw** generally moderate to high on clearcuts if overtopping vegetation is reduced at planting site; growth often poor due to cold soils and summer frost, but generally improved on raised microsites; •advance **Sxw** regeneration can contribute to restocking if protected during logging; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

SBPSmk Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Bl	**all species**	**all species**	
	Pl	***summer frost***		•shrub cover usually increases somewhat following canopy removal and surface disturbance.
	D:Act	Sxw, **Bl**, Pl, At, Act	Sxw, **Bl**, Pl, At, Act	
	At	***light deficits (vegetation overtop)***		
		Pl, Act, At	**Pl, Act, At**	
	•timber productivity very low; establishment and growth of trees limited by cold, wet soils and thick organic layers; •survival and growth of planted trees poor, except on raised microsites (natural or artificial); •advance **Sxw** regeneration can contribute to restocking if protected during logging; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			
08	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Pl	Sxw, **Pl**, **Sb**	Sxw, **Pl**, **Sb**	
	T:Sb	***summer frost***		•shrub cover usually increases little following canopy removal but may increase following surface disturbance and resulting soil warming.
		Sxw, Pl, Sb	Sxw, Pl, Sb	
		light deficits (vegetation overtop)		
		Pl	Pl	
	•timber productivity very low, and stands difficult to regenerate after logging; •survival and growth of planted **Sxw** and **Pl** generally poor, except moderate on raised microsites (natural or artificial); •survival of **Sb** on raised microsites likely moderate, but growth slow; •attempts to reduce frost damage by maintaining partial canopy likely overwhelmed by accumulation of cold air; •mechanical disturbance of soil surface may increase vigour and cover of shrub and herbaceous vegetation; •soils are very susceptible to rutting when not frozen.			

SBPSxc Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system is currently even-aged management (clearcutting), and the regeneration method is predominantly natural Pl regeneration. Drag scarification has been used on several sites to create a more favourable Pl seedbed and cone distribution. Since soil organic layers are thin, however, the benefits of drag scarification for seedbed management are questionable, and in recent years fewer sites have been drag scarified. Success of natural restocking has generally been high, although many sites have excessively high densities of Pl regeneration, requiring spacing for optimum growth. In addition, stocking distribution is often patchy, with patches of dense regeneration and small stocking voids. This may result, in part at least, from patchy cone distribution due to felling and bunching practices. Drag scarification does little to improve distribution. Pl cones are typically serotinous and apparently have a high proportion (>75%) of viable seed when closed. Cones typically open and shed seed early in the growing season following winter logging. There is relatively little artificial regeneration in the SBPSxc, although the number of openings being planted is increasing, especially in northern parts of the subzone. Disc trenching is sometimes used to control pinegrass cover if it is heavy, and create a suitable planting spot. Wet sites are typically planted with Sxw on artificially created mounds.

Principal crop tree species is Pl. A minor amount of Sxw occurs on wetter sites adjacent to streams and wetlands.

Partial harvest systems experience is very small. Tree seedling establishment in natural opening created by insects, diseases, wind, etc. indicates that natural regeneration will restock cleared openings wider than about 20 m.

Advance regeneration in Pl stands is primarily Pl and ranges from moderately dense to sparse, depending upon canopy closure. It is generally more dense than in the SBPSdc or SBPSmk due to the typically more open canopy. Height growth reponse of advance Pl regeneration to canopy clearing is generally slow and small, and advance regeneration is typically not a major contributor to restocking.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost reduces growth and occassionally causes mortality of Sxw and Pl, especially on gentle lower slopes.
Dwarf mistletoe is present in most regenerating Pl stands if a seed source is present on taller stems, and causes significant growth reductions.
Gall rust and blister rust affect a few stems in many regenerating stands and are often severe.
Root collar weevil affects scattered stems in many regenerating stands.
Mountain pine beetle is the principal agent of mortality in mature stems. A majority of mature trees have been killed in extensive areas.
Atropellis canker affects the timber value of many mature stems, especially in dense stands.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >50 m wide) group selection systems;

Canopy present for Pl stands refers to group selection systems with small and moderate-size (generally 20–50 m wide) harvested groups; it does not include single tree selection systems. **Canopy present** for Douglas-fir stands (on SBPSxc/02) refers to low-volume single tree selection systems. **Canopy present** for wet spruce stands (SBPSxc/05) refers to single tree selection or small patch (few trees) group selection.

SBPSxc Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Pl D:At	***moisture deficits*** ***summer frost*** ***nutrient deficits***		low; Pinegrass - kinnikinnick •pinegrass cover often small; may increase only slightly following canopy clearing; lichens abundant; •retention of soopolallie and decaying wood increases potential soil nitrogen additions.
	•**Pl** natural regeneration generally adequate to restock cleared and partial-cut sites if sufficient numbers of cones present and well distributed; scarification generally not required due to thin forest floors; scarification will generally not improve regeneration distribution; •natural **Pl** regeneration distribution often patchy, possibly due to harvest bunching and microsite variability; •height growth release of advance **Pl** regeneration is generally slow; •survival and growth of planted **Pl** generally adequate to restock cleared and partial-cut sites without vegetation control; •spacing to reduce high densities of juvenile stems reduces competition for soil moisture and increases growth; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
02a Typic Phase	P:Pl	***moisture deficits***		low; Pinegrass - kinnikinnick
	Fd (near IDF)	Fd, At	Fd, At	
		summer frost		•shrub and herb vegetation increases little following canopy clearing.
	D:At	Fd	----	
	•above (/01 site series) **Pl** natural regeneration comments generally apply; •planted **Pl** survival likely adequate to restock sites but will be improved by planting on partially shaded/protected microsites with least evapotranspiration stress; •survival and growth of planted **Fd** likely poor; most reliable regeneration option for **Fd** is release of advance regeneration and natural regeneration ingress under near-natural canopy levels of Fd and Pl; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			

SBPSxc Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>02b
Sand
Phase</td><td>P:Pl
D:At</td><td><i>moisture deficits</i>
<i>nutrient deficits</i>
<i>summer frost</i></td><td></td><td>low; Pinegrass - kinnikinnick
•pinegrass cover often small and increases little following canopy clearing; kinnikinnick and lichens abundant;
•soopolallie and decaying wood increase soil nitrogen availability.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required;
•natural Pl regeneration distribution often patchy, possibly due to harvest bunching and microsite variability; cone scattering should improve regeneration distribution;
•survival and growth of planted Pl generally adequate to restock cleared and partial-cut sites, but growth slower than on /01 sites;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>02c
Shallow
Phase</td><td>P:Pl
Fd (near IDF)
D:At</td><td><i>moisture deficits</i>
<u>Fd</u>
<i>summer frost</i>
Fd
<i>nutrient deficits</i></td><td>
Fd

----</td><td>low; Pinegrass - kinnikinnick

•pinegrass cover often small; kinnikinnick and lichens abundant.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed;
•densities of natural regeneration ingress generally less than on /01 sites, limited by shallow, rocky soils;
•planted Pl survival and growth best in microsites with deeper soil;
•survival of planted Fd likely poor in clearings; most reliable regeneration option forFd is release of advance regeneration and natural regeneration ingress under near-natural canopy levels of Fd and Pl;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

SBPSxc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Pl	***moisture deficits***		low to medium; Mixed shrub - scrub birch
	Sw	Sw	Sxw	
	D:At	***summer frost***		•shrub and herb vegetation increases little following tree canopy removal.
		Pl, Sw, At	Sw	
		light deficits		
		----	Pl, At	
		cold, moist soils		
	•**Pl** natural regeneration ingress usually slow and may not fully restock sites; fill planting may be required; •**Pl** plantations (with some **Sw**) likely adequate to restock sites if planted on raised microsites or possibly on exposed mineral soil to reduce frost damage; •damage to **Sw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture; benefits often overwhelmed by cold air accumulation if large upslope cold air source is present; •moisture deficits generally occur only in surface soils in mid to late growing season.			
04	P:Pl	***summer frost***		low to medium; Mixed shrub - scrub birch
	Sw	Sw	Sw	
	D:At	***light deficits***		•shrub cover generally remains sparse to open following tree harvesting.
		----	Pl, At	
		cold, moist soils		
	•survival and growth of planted **Pl** generally adequate to restock sites; growth improved on raised microsites; •**Pl** natural regeneration ingress often slow due to cold soils, thick soil organic layers, and competing vegetation; •growth of established **Pl** and **Sw** probably reduced by summer frosts; •frost damage to **Sw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture; benefits often overwhelmed by cold air accumulation if large upslope cold air source is present.			

SBPSxc Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
05	P:Pl Sw D:At Act	***cold, wet soils*** **Pl**, **Sw**, **At**, **Act** ***summer frost*** **Sw**, Pl, At ***light deficits (vegetation overtop)*** Pl, **At**, Act	 **Pl**, **Sw**, **At**, **Act** **Sw** **Pl**, **At**, Act	low to medium; Mixed shrub - wet forb •vegetation increase following canopy opening limited by cold, wet soils and thick organic layers.
	•restocking with **Pl** and **Sw** severely limited by cold, wet soils and frequent summer frosts; •survival and growth of planted **Sw** generally poor except moderate on raised microsites (natural or artificial); plantable spots limit planting density; advance **Sw** regeneration can contribute to restocking if not damaged in logging; •frost damage to **Sw** may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture; benefits often overwhelmed by cold air accumulation if large upslope cold air source is present.			
06	P:Pl Sw D:At Act	***light deficits (vegetation overtop)*** **Pl**, Sw, **At**, **Act** ***summer frost*** Sw ***cold, wet soils (wettest microsites)***	 **Pl**, Sw, **At**, **Act** ----	medium; Mixed shrub - moist shrub •shrub cover may increase significantly following tree canopy removal.
	•most productive sites for tree growth in SBPSxc; •survival and growth of planted **Sw** and **Pl** adequate to restock site only if vegetation controlled at planting spot; •growth of **Sw** and **Pl** best on slightly raised microsites (natural or artificial) or exposed mineral soil; •conifer canopy clearing often results in deciduous tree dominance if deciduous trees present; •partial forest canopy retention may reduce frost damage and limit growth of competing shrubs and deciduous trees; •**Pl** natural regeneration ingress severely limited by competing vegetation and relatively thick soil organic layers.			

SBSdw1 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system for Pl stands is currently even-aged management. Regeneration methods for these stands are either natural Pl regeneration or Pl planting. Scarification is generally not required for successful natural regeneration of cutover Pl sites. If pinegrass cover is heavy, plantation success may require control of the pinegrass followed by prompt planting. Disc trenching or other scarification method is often used to control pinegrass at the planting spot. Mineral soil exposure may also reduce frost frequency and severity. Regeneration of Fd stands is more problematical. Many Fd stands have been clearcut in the past but survival and growth of planted Fd on these sites has been variable and often poor, due probably to summer frost and moisture stress. Various forms of shelterwood systems are being widely considered, and initial results indicate that planting under a partial canopy may be much more successful than planting in cleared areas. Wet sites are generally planted with Sxw, often on artificially created mounds.

Principal Crop Tree Species are Pl and Fd, with lesser amounts of Sxw (primarily on sites wetter than mesic). Bl advance regeneration is often dense, but only seldom in the canopy and its timber values are limited by high mortality and frequent heart rot. Deciduous trees are commonly present in conifer forests, and deciduous stands are common in many areas.

Partial harvest systems experience is limited. Recent operational trials and research trials of shelterwood systems for Fd stands indicate better regeneration success, both for natural regeneration ingress and artificial regeneration, than with clearcutting.

Advance regeneration in Pl stands is most often relatively sparse, and consists primarily of Fd, Sxw, and Bl. In Fd stands, advance regeneration is predominantly Bl with some Sxw, and varies from sparse to very dense. Although the Bl is often of good form and vigour, its timber value is limited. In contrast to the IDF, Fd stands in the SBSdw1 are generally even-aged and one- or two-storied.

Principal Insect, Disease, and Abiotic Damage Concerns

Growing-season frost is a principal factor affecting regeneration success of Fd.

Douglas-fir beetle commonly causes mortality of canopy stems and is a principal concern in partial harvest systems.

Armillaria root disease causes growth losses and mortality of Fd and Pl trees, often occurring as infection centres killing several trees of all ages.

Mountain pine beetle is endemic in Pl stands, and kills isolated mature trees and some groups of trees. Damage has been much less than in the SBPSxc, but small outbreaks are common.

Dwarf mistletoe is frequent on regenerating Pl stems if infected taller stems are present. Significant growth losses may result.

Blister rusts and gall rusts are prevalent and locally severe on Pl.

White pine weevil is a potential problem in Sxw plantations.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger (generally >50 m wide) group selection systems;

Canopy present for Pl and most Sxw stands refers to group selection systems with small and moderate-size (generally 25–50 m wide) harvested groups. **Canopy present** for Fd stands except those on steep south-facing slopes (/03 site series) refers to a shelterwood system with about 30–60% volume removal in the regeneration cut. **Canopy present** for Fd stands in the /03 site series refers to single tree selection similar to that in the IDFdk3/01. **Canopy present** for wet spruce stands (/09 site series) refers to single tree selection or small (few trees) group selection systems.

SBSdw1 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***moisture deficits***		most common: medium; Mixed shrub - grass
	Pl	Fd, Sxw, Ep	Sxw	less common: medium; Dry alder - pinegrass (higher elevations)
	Sxw	***summer frost***		
	D:At	Fd	----	
	Ep	***light deficits***		•pinegrass cover typically increases following forest canopy removal and is a strong competitor for soil moisture.
		----	Pl, At, Ep	

- survival and growth of planted **Fd** variable and often poor on cleared areas; most reliable on slopes >15%; expected to be adequate to restock partial-cut sites if pinegrass and other vegetation controlled at planting spot;
- **Fd** natural regeneration generally slow on cleared areas but likely higher under partial canopy if mineral soil is exposed;
- survival and growth of planted **Pl** generally high on clearcut sites if pinegrass densities low; if pinegrass abundant then pinegrass control may be required to improve plantation growth;
- survival and growth of planted **Pl** in partial-cut sites low to moderate due to shading; **Pl** natural regeneration option in partial-cut systems may require some fill planting;
- survival and growth of planted **Sxw** moderate on moist microsites in cleared areas, and generally moderate to high under partial canopy if pinegrass is controlled at planting spot;
- **Sxw** advance regeneration may contribute to restocking if not damaged in logging;
- maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration;
- soils are susceptible to compaction and rutting following snowmelt and rainy periods.

SBSdw1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd	***moisture deficits***		low; Dry shrub - pinegrass
	Pl	**Fd**	Fd	
	D:At	***light deficits***		•vegetation development is limited by dryness but may compete strongly with tree seedlings for soil moisture.
		----	Pl, At	
		rooting restrictions (bedrock)		
		nutrient deficits		
	•**Pl** natural regeneration generally adequate to restock cleared sites if sufficient cones present and well distributed; •most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight; •survival and growth of planted **Fd** generally poor, and of planted **Pl** generally moderate on clearcuts; **Pl** growth reduced under partial-cut stands due to shading effects; •microsites of deeper soil provide the most suitable planting spots and the best survival and growth potential; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
03	P:Fd	***moisture deficits***		low; Dry shrub - pinegrass
	Pl	**Fd**, **At**	Fd, At	
	D:At	***nutrient deficits***		•undergrowth vegetation development is limited by dryness but may still compete strongly with tree seedlings for soil moisture.
		high surface temperatures (clearcuts)		
	•productivity for timber low, and sites difficult to restock after logging; •survival and growth of planted **Fd** generally poor due to hot, dry soils; most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration following very light partial cutting; •**Pl** natural regeneration generally adequate to regenerate Pl stands without site preparation if sufficient numbers of cones present and well distributed; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			

SBSdw1 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>04</td><td>P:Pl</td><td><i>moisture deficits</i></td><td></td><td>low; Dry shrub - kinnikinnick</td></tr>
<tr><td></td><td>Fd</td><td>Fd, Sxw, Ep</td><td>Sxw</td><td></td></tr>
<tr><td></td><td>Sxw</td><td><i>summer frost (level sites)</i></td><td></td><td></td></tr>
<tr><td></td><td>D:At</td><td>Fd</td><td>Fd</td><td></td></tr>
<tr><td></td><td>Ep</td><td><i>light deficits</i></td><td></td><td></td></tr>
<tr><td></td><td></td><td>----</td><td>Pl, At, Ep</td><td></td></tr>
<tr><td></td><td></td><td><i>nutrient deficits (sand)</i></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required but may increase early ingress rate; establishment and growth will be reduced in shaded microsites of partial cuts;
•survival of planted Pl generally high in clearcuts and poor to moderate in shaded microsites of partial cuts; growth likely enhanced by control of pinegrass at planting spot;
•planted Fd survival generally poor in clearcuts with gentle slopes but may be improved somewhat on clearcuts with &gt;15% slope or under partial canopy, which reduces frost damage;
•survival of planted Sxw likely poor except moderate in moist microsites under partial canopy;
•maintenance of soil organic layers and woody debris important for long-term nutrient availability.</td></tr>
<tr><td>05</td><td>P:Fd</td><td><i>moisture deficits</i></td><td></td><td>most common: low; Pinegrass - low forb</td></tr>
<tr><td></td><td>Pl</td><td>Sxw, Ep</td><td>----</td><td>less common: medium; Dry alder - pinegrass (mostly at higher elevations)</td></tr>
<tr><td></td><td>Sxw</td><td><i>light deficits</i></td><td></td><td></td></tr>
<tr><td></td><td>D:At</td><td>----</td><td>Pl, At, Ep</td><td></td></tr>
<tr><td></td><td>Ep</td><td></td><td></td><td>•pinegrass cover increases somewhat following canopy clearing.</td></tr>
<tr><td></td><td colspan="4">•/01 silviculture considerations above generally apply except:
•survival and growth of planted Fd, Pl, and Sxw as well as natural ingress of Fd and Sxw increased due to reduced frost risk and decreased moisture stress.</td></tr>
</table>

SBSdw1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd	***light deficits (vegetation overtop)***		medium; Mixed shrub - grass
	Pl	Fd, Pl, Sxw, Bl,	Fd, Pl, Sxw, Bl ,	
	Sxw	At, Act, Ep	At, Act. Ep	•shrub cover in mature stands will likely increase following canopy clearing;
	S:Bl	***summer frost***		
	D:At, Act, Ep	Fd	----	•spot treatments may be required for crop tree establishment in dense shrub cover.

•survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites only if vegetation controlled at planting spot and (for **Fd** and **Pl** in partial cuts) if planted in sunny / lightly shaded microsites;

•planted **Pl** survival likely poor in small group or shelterwood systems;

•**Fd** and **Sxw** natural regeneration ingress generally greatest under partial tree canopy where mineral soil is exposed; growth o established stems greatest in full sunlight;

•**Pl** natural regeneration ingress very limited by competing vegetation.

07	P:Fd	***summer frost***		medium; Mixed shrub - moist shrub
	Pl	Fd, Sxw, Bl	Fd, Sxw, Bl	
	Sxw	***light deficits (vegetation overtop)***		•shrub cover in mature stands will likely increase following canopy clearing.
	S:Bl	Fd, Pl, Act, At, Ep	Fd, Pl, Act, At, Ep	
	D:Act, At,	***cold soils***		
	Ep	Fd, Sxw, Bl, At, Ep	Fd, Sxw, Bl, At, Ep	

•**Fd** and **Pl** natural regeneration severely limited by competing vegetation, cold soils, and moderately thick soil organic layers;

•reliability of **Sxw** natural regeneration limited by cold, moderately thick soil organic layers and inconsistent seedcrop;

•survival and growth of planted **Sxw** and **Pl** generally adequate to restock site if vegetation controlled at planting spot and planted on raised microsites or moderately well-drained mineral soil; growth of planted **Pl** and **Fd** poor in shaded microsites;

•frost damage to **Sxw** may be reduced by planting under partial canopy or nurse crop, or as part of Pl-dominated mixture.

SBSdw1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Fd	***summer frost***		medium; Mixed shrub - moist shrub
	Pl	**Fd**, Sxw, Bl	**Fd**, Sxw, Bl	
	Sxw	***light deficits (vegetation overtop)***		•shrub cover may increase significantly following forest canopy removal.
	S:Bl	**Fd**, **Pl**, **Act**, **At**, **Ep**	**Fd**, **Pl**, **Act**, **At**, **Ep**	
	D:Act, At,	***cold, wet soils***		
	Ep	**Fd**, Sxw, Bl, At, Ep	**Fd**, Sxw, Bl, At, Ep	
	•comments under /07 above generally apply.			
09	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Bl	**all species**	**all species**	•shrub and herbaceous vegetation increases somewhat following canopy clearing but is limited by cold, wet soils and thick moss cover;
	Pl	***summer frost***		
	D:Act	**Sxw**, **Bl**, Pl, Act	**Sxw**, **Bl**, Pl, Act	
		light deficits (vegetation overtop)		•soil disturbance may enhance shrub and herbaceous growth due to soil warming and drainage.
		Pl, Act	**Pl**, **Act**, Sxw	
	•low-productivity sites for timber, and difficult to restock after logging; •survival and early growth of planted **Sxw** generally poor except moderate on raised microsites; •**Pl** is not common on these sites; **Pl** growth to maturity not well adapted to sites with near-surface water table; •frost damage to **Sxw** may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present; •sites very susceptible to soil rutting and compaction; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

SBSdw2 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system for Pl stands is currently even-aged management. Regeneration methods for these stands are either natural Pl regeneration or Pl planting. Scarification is generally not required for successful natural regeneration of cutover Pl sites. If pinegrass cover is heavy, plantation success may require control of the pinegrass followed by prompt planting. Disc trenching or other scarification method is often used to control pinegrass at the planting spot. Mineral soil exposure may also reduce frost frequency and severity. Regeneration of Fd stands is more problematical. Many Fd stands have been clearcut in the past, but survival and growth of planted Fd on these sites has been variable and often poor, due probably to summer frost and moisture stress. Various forms of shelterwood systems are being widely considered, and initial results indicate that planting under a partial canopy may be much more successful than planting in cleared areas. Wet sites are generally planted with Sxw, often on artificially created mounds.

Principal Crop Tree Species are Pl and Fd, with lesser amounts of Sxw (primarily on sites wetter than mesic).

Partial harvest systems experience is limited. Recent operational trials and research trials of shelterwood systems for Fd stands in the SBSdw1 indicate better regeneration success, both for natural regeneration ingress and artificial regeneration, than with clearcutting.

Advance regeneration in Pl stands is most often relatively sparse, and consists primarily of Fd, Sxw, and Bl. In Fd stands, advance regeneration is predominantly Fd and Sxw, and varies from sparse to moderately dense. The Fd and Sxw are generally of good form and vigour and can contribute to restocking of partial-cut stands.

Principal Insect, Disease, and Abiotic Damage Concerns

Growing-season frost is a principal factor affecting regeneration success of Fd.
Winter dessication damage is common on sites with shallow snowpack and winter exposure of tree needles to relatively warm winter air.
Douglas-fir beetle commonly causes mortality of canopy stems and is a principal concern in partial harvest systems.

Armillaria root disease causes growth losses and mortality of Fd and Pl trees, often occurring as infection centres killing several trees of all ages.
Mountain pine beetle is endemic in Pl stands and kills isolated mature trees and some groups of trees. Damage has been much less than in the SBPSxc, but small outbreaks are common. Large Pl trees are prime beetle habitat.
Dwarf mistletoe is frequent on regenerating Pl stems if infected taller stems are present. Significant growth losses may result.
Blister rusts and gall rusts are prevalent and locally severe on Pl.
White pine weevil is a potential problem in Sxw plantations.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger (generally >50 m wide) group selection systems;

Canopy present for Pl and most Sxw stands refers to group selection systems with small and moderate-size (generally 25–50 m wide) harvested groups. **Canopy present** for Fd stands except those on steep south-facing slopes (/04 site series) refers to a shelterwood system with 30–60% volume removal prior to the final cut. **Canopy present** for Fd stands in the /04 site series refers to single tree selection similar to that in the IDFdk3/01. **Canopy present** for wet spruce stands (/10 and /11 site series) refers to single tree selection or small (few trees) group selection systems.

SBSdw2 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***moisture deficits***		most common: medium; Mixed shrub - grass
	Pl	Sxw, Fd, Ep	Sxw	less common: medium; Dry alder - pinegrass (higher elevations)
	Sxw	***summer frost (gentle slopes)***		
	D:At	**Fd**	Fd	•pinegrass abundance typically increases following canopy clearing and is a strong competitor for soil moisture.
	Ep	***light deficits***		
		----	Pl, At, Ep	

•**Pl** natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones are present and well distributed, and pinegrass is not abundant; if pinegrass abundant, scarification will likely increase **Pl** ingress and growth;

•survival and growth of planted **Pl** generally high in cleared areas if pinegrass removed at planting spot or cover naturally low;

•survival and growth of planted **Pl** in partial-cut sites low to moderate due to shading; **Pl** natural regeneration of partial-cut sites may require some fill planting;

•survival and growth of planted **Fd** variable and often poor on cleared areas with slopes <15%; likely moderate on steeper slopes and under partial canopy with spot vegetation control;

•**Fd** natural regeneration ingress best under partial canopy on exposed mineral soil; growth of established seedlings greatest in full sunlight;

•survival and growth of **Sxw** generally poor, except moderate on moist microsites under partial canopy;

•maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration;

•soils susceptible to compaction and rutting when moist; soils often remain moist for long periods following snowmelt and rainy periods, due to drainage restrictions.

SBSdw2 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>02</td><td>P:Fd
Pl</td><td><i>moisture deficits</i>
Fd
<i>rooting restrictions (bedrock)</i>
<i>nutrient deficits</i></td><td>
Fd</td><td>low; Dry shrub - pinegrass
•shrub and herbaceous vegetation growth is limited by dryness but competes strongly with tree seedlings for soil moisture and nutrients.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration generally adequate to restock cleared and partial-cut sites if sufficient numbers of cones present and well distributed; scarification not required;
•survival and growth of planted Fd on cleared areas variable and often poor, but likely improved under partial canopy;
•survival and growth of planted Pl moderate in clearcuts and partial cuts;
•microsites of deeper soil typically present and provide most suitable planting spots;
•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>03</td><td>P:Pl
Fd
D:At</td><td><i>moisture deficits</i>
Fd, At
<i>summer frost (gentle slopes)</i>
Fd
<i>nutrient deficits</i>
Fd</td><td>
Fd, At

Fd

Fd</td><td>low; Dry shrub - kinnikinnick

•shrub and herbaceous vegetation increases little following canopy opening.</td></tr>
<tr><td></td><td colspan="4">•Pl natural regeneration generally adequate to restock cleared and partial-cut sites if sufficient numbers of cones present and well distributed; scarification generally not required but may increase ingress rate;
•growth and survival of planted Pl generally high in clearcuts and moderate in partial cuts; vegetation control not required;
•survival and growth of planted Fd likely poor in clearcuts, and poor to moderate on moist sites under partial canopy;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
</table>

SBSdw2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd	***moisture deficits***		low; Dry shrub - pinegrass
	Pl	**Fd**	**Fd**	
	D:At	***high surface temperatures***		•shrub and herbaceous vegetation increases little following canopy opening.
		Fd, Pl	----	
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; •survival of planted **Fd** in cleared areas poor, but may be improved somewhat in moist microsites under partial canopy; •initial survival of planted **Pl** likely high, but growth may be limited by hot, dry soils; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			
05	P:Fd	***moisture deficits***		most common:low; Pinegrass - low forb
	Pl	Sxw, Ep	Sxw, Ep	less common: medium; Dry alder - pinegrass (mostly higher elevations)
	Sxw	***light deficits***		
	D:At	----	Pl, At, Ep	
	Ep			•pinegrass cover increases somewhat following forest canopy removal and competes for soil moisture.
	•comments under SBSdw2/01 above generally apply except: •survival and growth of planted **Fd**, **Pl**, and **Sxw** as well as natural ingress of **Fd** and **Sxw** increased due to reduced frost risk and decreased moisture stress.			

SBSdw2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd	***moisture deficits***		medium; Dry shrub - pinegrass
	Pl	Fd, **Sxw**, Ep	Sxw, Ep	
	Sxw	***summer frost (gentle slopes)***		
	D:At	**Fd**	Fd	
	Ep	***light deficits***		
		----	Pl ,At, Ep	
		nutrient deficits (sand)		

•**Pl** natural regeneration generally adequate to restock cleared sites if sufficient cones present and well distributed; scarification generally not required, but may increase early ingress rate; establishment and growth may be reduced in shaded microsites of partial cuts;

•survival and growth of planted **Pl** generally sufficient to restock clearcuts and sunny microsites of partial cuts if pinegrass densities low; if pinegrass abundant, then pinegrass reduction generally required for successful plantations;

•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight;

•maintenance of soil organic layers and woody debris important for *long-term site productivity* and natural regeneration.

SBSdw2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
07	P:Pl	***summer frost***		low; Mixed shrub - grass
	Sxw	Sxw	----	
	S:Sb (north)	***cold soils***		•pinegrass cover generally small, and increases slightly following logging;
	D:At	Sxw, At	Sxw, At	
		light deficits		•shrub cover generally small to moderate following logging.
		—	Pl, At	
		moisture deficits		

- •survival of planted **Pl** and **Sxw** likely moderate to high in cleared areas but growth limited by cold soils and summer frost; growth may be improved by planting on exposed mineral soil or slightly raised microsites in full sunlight;
- •natural regeneration by **Pl** will likely not achieve full stocking without scarification resulting in soil warming;
- •**Sxw** natural regeneration may partially restock small openings on exposed mineral soil if Sxw present in adjacent stand, but reliability affected by inconsistency of Sxw seed crop;
- •advance **Sxw** regeneration is often of good form and vigour, and can contribute to restocking;
- •advance **Sb** regeneration often present, but growth slow and sawlog values generally low due to small size;
- •frost damage to **Sxw** may be reduced by planting under partial canopy or nurse crop, but this will reduce soil warming.

SBSdw2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Fd	***summer frost***		medium; Mixed shrub - moist shrub
	Pl	**Fd**, Sxw, Bl	**Fd**, Sxw, Bl	
	Sxw	***cold, moist soils***		•shrub cover may increase significantly following forest canopy clearing.
	S:Bl	**Fd**, Sxw, Bl, At, Ep	**Fd**, Sxw, Bl, At,	
	D:Act	Ep		
	At	***light deficits (vegetation overtop)***		
	Ep	Fd, Pl, Act, At, Ep	Fd, **Pl**, **Act**, **At**, **Ep**	
	•survival of planted **Sxw** and **Pl** generally poor without vegetation control at planting spot; •early growth of **Sxw** poor to moderate, limited by summer frost and cold soils; •frost damage to **Sxw** may be somewhat reduced by planting on raised microsites or under partial canopy; •planted **Fd** survival and growth generally poor due to frost, cold soils, and vegetation.			
09	P:Fd	***light deficits (vegetation overtop)***		high; Mixed shrub - tall fern
	Pl	**Fd**, **Pl**, Sxw, Bl,	**Fd**, **Pl**, Sxw, Bl,	
	Sxw	**Act**, **At**, **Ep**	**Act**, **At**, **Ep**	•shrub and herbaceous vegetation vigorous; generally increases following canopy clearing and soil disturbance.
	S:Bl	***summer frost (gentle slopes)***		
	D:Act	Fd, Sxw, Bl	Fd	
	At	***cold, moist soils (toe slopes)***		
	Ep	Fd	Fd	
	•survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** adequate to restock cleared and partial-cut sites only if vegetation controlled at planting spot and (for **Fd** and **Pl** in partial cuts) if planted in sunny / lightly shaded microsites; •planting on raised microsites will generally reduce vegetation competition and increase soil temperatures; •natural regeneration of all species severely limited by competing shrub and herbaceous vegetation; •advance **Sxw** regeneration generally of good form and vigour, and can contribute significantly to restocking; •these sites are very susceptible to compaction, rutting, and surface erosion.			

SBSdw2 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth: No or limited canopy	Principal site factors limiting tree establishment and early growth: Canopy present	Vegetation potential and complex
10	P:Sxw S:Bl Pl D:Act	***cold, wet soils*** **all species** ***summer frost*** Sxw, **Bl**, Pl, Act ***light deficits (vegetation overtop)*** Pl, Act	 **all species** Sxw, **Bl**, Pl, Act Sxw, **Pl**, **Act**	medium; Mixed shrub - wet forb •shrub and herbaceous vegetation increases somewhat following canopy clearing and soil disturbance but growth is limited by cold, wet soils and thick moss cover.
	•low-productivity sites for timber, and difficult to restock after logging; •survival and early growth of planted **Sxw** and **Bl** generally poor, except moderate on raised microsites; •**Pl** is not common on these sites; **Pl** growth to maturity not well adapted to sites with near-surface water table; •frost damage to **Sxw** may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present; •sites very susceptible to soil rutting and compaction; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			
11	P:Sxw S:Pl T:Sb (northern areas)	***cold, saturated soils*** Sxw, **Pl**, **Sb** ***summer frost*** Sxw, Pl, Sb ***light deficits (vegetation overtop)*** Pl	 Sxw, **Pl**, **Sb** Sxw, Pl, Sb Pl	medium; Mixed shrub - wet forb
	•forested wetlands; low-productivity sites for timber; difficult to reforest; •comments under /10 above generally apply.			

SBSmc1 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the SBSmc1 is currently even-aged management (clearcutting). The predominant regeneration method is planting, both in cutover Pl and Sxw stands. Logged Pl sites are typically planted with Pl, while logged Sxw sites are typically planted with Sxw or a Pl/Sxw mixture. Mixtures reduce the risk of damage to Sxw from white pine weevil and frost. Scarification, primarily disc trenching, is often used to create favourable planting sites by exposing mineral soil and reducing vegetation competition. If slash loading is high and restricts planter access, as on some cutover Sxw stands, slash may be burned, or piled and burned, but this practice is not widespread.

Partial harvest systems experience in the SBSmc1 is essentially nonexistent.

Advance regeneration in Pl and Sxw stands ranges from relatively sparse to moderately dense, and consists primarily of Bl and Sxw. In Pl stands, most Sxw and many of the Bl stems <50 cm tall are of good form and vigour. Height growth releases following canopy opening. In Sxw/Bl stands with a high canopy closure, much of the Bl is of poor form and has incipient decay. Bl is susceptible to significant heart rot when mature.

Principal Insect, Disease, and Abiotic Damage Concerns

Pine dwarf mistletoe is endemic in Pl stands and results in growth losses, but is less prevalent than in the SBPS.
Stem rusts are present on Pl but cause relatively little growth loss.
Mountain pine beetle is common in mature Pl stands and causes mortality of many mature stems. However, the frequency and extent of mortality is less than in the SBPS.
Tomentosus root rot causes mortality of young and immature Sxw and Pl stems, often in infection centres.
White pine weevil can cause extensive terminal dieback of young open-grown trees. Planting Sxw in mixtures with Pl can reduce risk of damage.
Spruce beetle damage risks are moderate in areas of windthrow and timber harvesting.
Growing-season frost can significantly damage young Sxw, especially on

gentle lower slopes and in depressions.
Winter dessication damage has been noted on sites with low snowpack where young conifer needles are exposed to relatively warm winter air.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >60 m wide) group selection systems;

Canopy present for Pl and most Sxw stands refers to group selection systems with small and moderate-size (generally 30–60 m wide) harvested groups. **Canopy present** for Fd stands on steep south-facing slopes (/03 site series) refers to low- to moderate-volume removal single tree selection similar to that in the IDFdk3/01. **Canopy present** for wet spruce stands (/08 site series) refers to single tree selection or small (two to few trees) group selection.

SBSmc1 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01a	P:Pl	***summer frost (gentle slopes)***		medium; Mixed shrub - low forb
Typic	Sxw	**Fd**	Fd	
Phase	Fd	***light deficits***		•shrub and herb cover typically increases slightly and slowly following canopy clearing.
	S:Bl	----	Pl, Act	
	D:Act	***moisture deficits***		

- •summer frost may reduce survival and growth of **Sxw** and **Bl** on gentle slopes in some years, especially where large upslope cleared areas are present;
- •survival and growth of planted **Pl** and **Sxw** generally adequate to restock cleared sites without vegetation control if planted promptly; on partial cuts, survival and growth of **Pl** likely poor to moderate on shaded microsites;
- •survival and growth of planted **Fd** likely adequate to restock cleared and partial-cut sites on slopes >15% in Dragon Mountain and Bowers Lake areas; growth likely best in partial cut or under partial canopy to reduce frost damage; in Moffat Lakes area and on slopes <15% elsewhere, survival and growth likely severely limited by frost;
- •**Pl** natural regeneration stocking very limited by moderately thick soil organic layers; stocking density and distribution may be increased by scarification;
- •advance **Sxw** and **Bl** regeneration often of good form and vigour, and can contribute to restocking.

SBSmc1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01b Shallow Phase	P:Pl Sxw Fd S:Bl D:Act	***moisture deficits*** Sxw, Bl ***summer frost*** Fd, Sxw, Bl ***light deficits (vegetation overtop)*** ----	 ---- Fd Pl, Act	low; Mixed shrub - low forb •shrub and herb cover increases little and only slowly following canopy clearing.
	•same as /01a except: •microsites with deeper soil limit suitable planting spots; •trees with large, dense crowns exposed to winds by logging are susceptible to windthrow; •maintenance of soil organic layers and woody debris especially important for long-term productivity and regeneration.			
01c Sandy Phase	P:Pl Sxw Fd S:Bl D:Act	***summer frost (gentle slopes)*** **Fd** ***moisture deficits*** Sxw, Bl ***light deficits (vegetation overtop)*** ---- ***nutrient deficits***	 Fd ---- Pl, Act	medium; Mixed shrub - low forb •shrub and herb cover increases little following canopy clearing.
	•summer frost limitation ratings above apply to Dragon Mountain and Bowers Lake areas; **Fd** also severely limited by summer frost on "canopy present" sites in Moffat Lakes area; •same as /01a except: •**Sxw** growth slower due to greater moisture stress; •maintenance of soil organic layers and woody debris especially important for long-term productivity and regeneration.			

SBSmc1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Pl T:Bl Sxw	***moisture deficits*** **Bl**, **Sxw** ***rooting restrictions (bedrock)*** ***nutrient deficits***	Bl, Sxw	medium; Ericaceous shrub - low shrub •shrub and herb cover increases little following canopy clearing.
	•sites have low productivity for timber; •survival and growth of planted **Pl** usually adequate to restock cleared and partial-cut sites if planted in pockets of deeper soil; •**Bl** and **Sxw** growth on these sites generally slow; limited by dryness and nutrient deficiencies; •maintenance of soil organic layers and woody debris important for long-term site productivity and regeneration.			
03	P:Fd Pl D:At	***moisture deficits*** Fd	Fd	medium; Dry shrub - pinegrass •pinegrass increases somewhat following canopy opening and is a strong competitor for soil moisture.
	•most reliable regeneration option for **Fd** is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight; •**Pl** natural regeneration may be adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required; •survival and growth of planted **Pl** should be sufficient to restock cleared sites and sunny microsites of partial-cut sites; •survival and growth of planted **Fd** expected to be moderate due to moisture stress; •maintenance of soil organic layers and woody debris important for long-term nutrient availability and natural regeneration.			

SBSmc1 Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>04</td><td>P:Pl
Sxw
S:Bl</td><td><i>summer frost</i>
Sxw, Bl
<i>light deficits (vegetation overtop)</i>
Pl
<i>cold soils</i></td><td>
Sxw, Bl

Pl</td><td>low to medium; Mixed shrub - low forb
•vegetation generally changes little following canopy opening.</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Sxw generally adequate to restock cleared and partial-cut sites if measures taken to reduce frost; frost damage to Sxw may be reduced by planting on raised microsites or under partial canopy or nurse crop; planting as part of Pl-dominated mixture may also reduce frost damage after Pl provides protective canopy;
•survival and growth of planted Pl generally adequate to restock cleared site if vegetation controlled at planting spot; in partial cuts, Pl plantations limited by shade;
•natural regeneration of Pl limited by cold soils and thick soil organic layers.</td></tr>
<tr><td>05</td><td>P:Pl
Sxw
S:Bl</td><td><i>summer frost</i>
Sxw, Bl
<i>light deficits (vegetation overtop)</i>
Pl
<i>cold, moist soils</i>
Pl, Sxw, Bl</td><td>
Sxw, Bl

Pl

Pl, Sxw, Bl</td><td>medium; Mixed shrub - moist shrub
•shrub cover may increase significantly following canopy clearing; willows common.</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Pl, Sxw, and Bl generally adequate to restock cleared and partial-cut sites if planted on exposed mineral soil or raised microsites; vegetation control likely necessary for adequate survival;
•natural regeneration of Pl limited by cold soils and thick soil organic layers;
•frost damage to Sxw and Bl may be reduced by planting on raised microsites, under partial canopy or nurse crop, or as part of Pl-dominated mixture; benefits may be overwhelmed by cold air accumulation if large upslope cold air source is present.</td></tr>
</table>

SBSmc1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Pl	***summer frost (gentle slopes)***		medium; Mixed shrub - moist shrub
	Sxw	**Fd**, Sxw	Fd	
	Fd	***light deficits (vegetation overtop)***		•shrub cover may increase significantly following canopy clearing and/or soil disturbance.
	S:Bl	**Pl**, **Fd**, **Act**	**Pl**, Sxw, **Fd**, Act	
	D:Act	***cold, moist soils***		
		Fd	Fd	
	•prompt planting and vegetation control generally required for adequate survival of planted **Pl**, **Sxw**, **Fd**, and **Act** on sites with abundant shrub cover; •survival of planted **Fd** expected to be poor on gentle slopes and in areas where it does not occur naturally (Moffat Lakes area); on steeper slopes in other areas, survival and growth likely poor on cleared areas, and poor to moderate on partial-cut areas; •**Fd** and **Pl** natural regeneration is severely limited by cold soils, thick soil organic layers, and competing vegetation; •soils very susceptible to compaction and rutting when not frozen.			
07	P:Pl	***light deficits (vegetation overtop)***		high; Mixed shrub - tall fern
	Sxw	**all species**	**all species**	
	Fd	***summer frost (gentle slopes)***		•high percent cover of devil's club replaced after logging by high percent cover of other shrubs and tall herbs.
	S:Bl	**Fd**, Sxw, Bl	Fd	
	D:Act	***cold, moist soils (toe slopes)***		
		Fd, Sxw	Fd, Sxw	
	•survival and growth of planted **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared sites if vegetation controlled at planting spot; **Fd** survival poor, except moderate on steeper slopes; in partial cuts, **Pl** and **Fd** survival likely poor in shaded microsites; •natural regeneration of all tree species limited by thick soil organic layers and vigorous shrub and herbaceous cover; •advance **Sxw** and **Bl** often of good form and vigour, and can contribute to restocking; •soils generally very susceptible to compaction and rutting and, on steeper slopes, to surface erosion.			

SBSmc1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Bl	**all species**	**all species**	
	Pl	***light deficits (vegetation overtop)***		•shrub and herb cover increase limited by cold, wet soils; soil disturbance may increase shrub cover.
	D:Act	Pl, Act	Sxw, **Pl**, **Act**	
		summer frost		
		Sxw, **Bl**, Pl, Act	**Sxw**, **Bl**, Pl, Act	

•low-productivity sites for timber, and difficult to restock after logging;

•survival and early growth of planted **Sxw** and **Bl** generally poor, except moderate on raised microsites;

•**Pl** is not common on these sites; **Pl** growth to maturity not well adapted to sites with near-surface water table;

•frost damage may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present;

•sites very susceptible to soil rutting and compaction;

•trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.

SBSmc2 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the SBSmc2 is currently even-aged management (clearcutting). Although natural regeneration of cutover Pl stands has been common in the past, the predominant regeneration method is currently planting, both in cutover Pl and Sxw stands. Logged Pl sites are typically planted with Pl, while logged Sxw sites are typically planted with Sxw or a Pl/Sxw mixture. Mixtures reduce the risk of damage to Sxw from frost. Scarification, primarily disc trenching, is often used to create favourable planting sites by exposing mineral soil and reducing vegetation competition. If slash loading is high and restricts planter access, as on some cutover Sxw stands, slash may be burned, or piled and burned. This practice is not widespread. Natural regeneration methods for Pl, especially following winter logging, commonly include drag scarification to improve seedbed conditions.

Partial harvest systems experience in the SBSmc1 for industrial forest regeneration is essentially nonexistent.

Advance regeneration in Pl and Sxw stands ranges from relatively sparse to moderately dense, and consists primarily of Bl and Sxw. In Pl stands, most Sxw and many of the Bl stems <50 cm tall are of good form and vigour. Height growth releases following canopy opening. In Sxw/Bl stands with a high canopy closure, much of the Bl is of poor form and has incipient decay. Bl is susceptible to significant heart rot when mature.

Principal Insect, Disease, and Abiotic Damage Concerns

Pine dwarf mistletoe is endemic in Pl stands and results in growth losses, but is less prevalent than in the SBPS.

Stem rusts are present on Pl but cause relatively little growth loss.

Mountain pine beetle is common in mature Pl stands and causes mortality of many mature stems. However, the frequency and extent of mortality is less than in the SBPS.

Tomentosus root rot causes mortality of young and immature Sxw and Pl stems, often in infection centres.

White pine weevil can cause extensive terminal dieback of young open-grown trees. Planting Sxw in mixtures with Pl can reduce risk of damage.

Spruce beetle may cause mortality of larger Sxw, especially in areas of windthrow and poor logging.
Growing-season frost can significantly damage young Sxw, especially on gentle lower slopes and in depressions.
Winter dessication damage has been noted on sites with low snowpack where young conifer needles are exposed to relatively warm winter air.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and group selection systems with larger (generally >60 m wide) harvested groups;

Canopy present for Pl and most Sxw stands refers to group selection systems with small and moderate-size (generally 30–60 m wide) harvested groups. **Canopy present** for wet spruce stands (/11 site series) refers to single tree selection or small (two to few trees) group selection.

SBSmc2 (Cariboo Forest Region) Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01a Typic Phase	P:Pl Sxw S:Bl	***light deficits (vegetation overtop)*** ---- ***summer frost (gentle slopes)***	 Pl	medium; Mixed shrub - low forb •shrub and herb cover increases slightly and slowly following canopy clearing.
	•summer frost may reduce survival and growth of **Sxw** and **Bl** on gentle slopes in some years, especially where large upslope cleared areas are present; •survival and growth of planted **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Pl** in partial cuts) if planted in sunny / lightly shaded microsites; •need for vegetation control to establish **Pl**, **Sxw**, and **Bl** will be minimized if planted promptly following harvesting; •**Pl** natural regeneration stocking limited by moderately thick soil organic layers; scarification generally required for restocking; •advance **Sxw** and **Bl** regeneration often of good form and vigour, and can contribute to restocking; •compaction hazard generally high following snowmelt or rainy periods.			
01b Shallow Phase	P:Pl Sxw S:Bl	***moisture deficits*** Sxw, Bl ***light deficits*** ---- ***rooting restrictions (shallow soils)***	 Sxw, Bl Pl	low; Mixed shrub - low forb •shrub and herb cover generally increases little and only slowly following canopy clearing.
	•same as /01a except: •survival and growth of all species best on microsites of deeper soil; •maintenance of soil organic layers and woody debris especially important for long-term site productivity and regeneration; •trees with large, dense crowns exposed to winds by logging are generally very susceptible to windthrow.			

SBSmc2 (Cariboo Forest Region) Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02a Typic Phase	P:Pl T:Bl Sxw	***moisture deficits*** Bl, Sxw ***rooting restrictions (bedrock)***	 Bl, Sxw	medium; Ericaceous shrub - low shrub •shrub and herb cover increases little and only slowly following canopy removal.
	•**Pl** natural regeneration generally adequate to restock cleared and partial-cut sites if sufficient numbers of cones present and well distributed; scarification generally not required but may increase early ingress rate; ingress rates and growth likely reduced in shaded microsites of partial cuts; •survival and growth of planted **Pl** likely sufficient to restock cleared and partial-cut sites if planted in deep soil; short plug stock may be especially suitable for these sites; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration; •**Bl** and **Sxw** growth on these sites generally slow; limited primarily by dryness and rooting restrictions.			
02b Sand Phase	P:Pl T:Bl Sxw	***summer frost (gentle slopes)*** Bl, Sxw ***moisture deficits*** Bl, Sxw ***light deficits (vegetation overtop)*** ---- ***nutrient deficits***	 Bl, Sxw Bl, Sxw Pl	medium; Ericaceous shrub - low shrub •shrub and herb cover increases little following canopy clearing.
	•**Pl** natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed; scarification generally not required; ingress rate reduced in shaded microsites of partial cuts; •survival and growth of planted **Pl** generally sufficient to restock cleared sites without vegetation control; survival in partial-cut sites likely reduced in shaded microsites; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration; •**Bl** and **Sxw** growth on these sites generally slow; limited by frost, dryness, and nutrient deficiencies.			

SBSmc2 (Cariboo Forest Region) Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>04</td><td>P:Pl</td><td colspan="2"><i>light deficits (vegetation overtop)</i></td><td>low; Mixed shrub - low forb</td></tr>
<tr><td></td><td>Sxw</td><td>----</td><td>Pl</td><td></td></tr>
<tr><td></td><td>S:Bl</td><td><i>summer frost</i></td><td></td><td>•shrub cover generally increases slightly and slowly following canopy clearing.</td></tr>
<tr><td></td><td></td><td>Sxw</td><td>----</td><td></td></tr>
<tr><td></td><td></td><td><i>cold soils</i></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Pl and Sxw generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for Pl in partial cuts) if planted in sunny / lightly shaded microsites; growth best on raised microsites or exposed mineral soil;
•natural regeneration of Pl limited by thick soil organic layers; scarification generally necessary for restocking;
•frost damage to Sxw may be reduced by planting under partial canopy or nurse crop, or as part of Pl-dominated mixture;
•advance Sxw and Bl often of good form and vigour, and can contribute to restocking.</td></tr>
<tr><td>06</td><td>P:Pl</td><td colspan="2"><i>light deficits (vegetation overtop)</i></td><td>medium; Mixed shrub - low forb</td></tr>
<tr><td></td><td>Sxw</td><td>Pl, Act</td><td>Pl, Act</td><td></td></tr>
<tr><td></td><td>S:Bl</td><td><i>cold soils</i></td><td></td><td>•shrub cover may increase significantly following canopy clearing.</td></tr>
<tr><td></td><td>D:Act</td><td><i>summer frost</i></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Pl, Sxw, and Bl generally adequate to restock cleared and partial-cut sites if planted on raised microsites or exposed mineral soil, if vegetation controlled at planting spot, and (for Pl in partial cuts) if planted in sunny / lightly shaded microsites;
•natural regeneration of Pl limited by thick soil organic layers and inadequate cones;
•soils generally very susceptible to soil compaction and rutting when not frozen.</td></tr>
</table>

SBSmc2 (Cariboo Forest Region) Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>08</td><td>P:Sxw
S:Bl
Pl</td><td><i>summer frost</i>
Sxw, Bl
<i>cold, wet soils</i>
Sxw, Bl, Pl
<i>light deficits (vegetation overtop)</i>
Sxw, Bl, Pl</td><td>
Sxw, Bl

Sxw, Bl, Pl

Sxw, Bl, Pl</td><td>medium; Mixed shrub - moist shrub
•shrub cover may increase significantly and quickly following canopy clearing.</td></tr>
<tr><td></td><td colspan="4">•natural regeneration of Pl very limited by cold soils, thick soil organic layers, and lack of cones;
•survival and growth of planted Sxw and Pl adequate to restock cleared sites if planted on raised microsites or exposed mineral soil, and only if vegetation controlled at planting spot; survival of planted Pl likely low in shaded microsites of partial cuts;
•frost damage to Sxw and Bl may be somewhat reduced by planting on raised microsites or under partial canopy;
•trees with large, dense crowns exposed to winds by logging are generally very susceptible to windthrow.</td></tr>
<tr><td>11</td><td>P:Sxw
S:Bl
Pl
D:Act</td><td><i>cold, saturated soils</i>
all species
<i>summer frost</i>
Sxw, Bl, Pl, Act
<i>light deficits (vegetation overtop)</i>
Pl, Act</td><td>
all species

Sxw, Bl, Pl, Act

Sxw, Pl, Act</td><td>medium; Mixed shrub - wet forb
•shrub and herb cover increase limited by cold, wet soils; soil disturbance may increase vegetation cover.</td></tr>
<tr><td></td><td colspan="4">•low-productivity sites for timber, and difficult to restock after logging;
•survival and early growth of planted Sxw poor, except moderate on raised microsites;
•frost damage to Sxw may be slightly reduced by planting on raised microsites but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present;
•soils very susceptible to rutting and compaction;
•trees with large, dense crowns exposed to winds by logging are generally very susceptible to windthrow.</td></tr>
</table>

SBSmh Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the SBSmh is even-aged management (clearcutting), and the regeneration method is nearly all artificial (planting). Most sites are planted with Fd or Sxw, although Pl has also been successfully established on some sites. Sites without vigorous competing vegetation are typically planted without site preparation. Where vigorous competing vegetation is present (mostly tall shrubs and small deciduous trees), continuous scarification (planting trails) has been used to control the vegetation prior to planting. Currently, however, competing vegetation is most often controlled by spot herbicide application in which herbicides are applied around the planted tree as necessary. Broadcast burning has not been used in the SBSmh.

Principal Crop Tree Species are Fd and Sxw. Although Pl is included in the stocking standards only for site series /02, /03, and /06, Pl has been successfully established on a wider range of sites including site series /01, /04, and /05. Since it does not occur naturally on these sites, it is used with caution. Deciduous tree species, especially Ep and Act, are abundant, and are increasingly being commercially harvested.

Partial harvest systems experience is very limited. On mule deer winter ranges, partial harvesting systems in even-aged Fd stands have included group selection (conversion to uneven-aged) systems with very small (10–20 m wide) harvested groups and retention of scattered mature trees.

Advance regeneration on mesic and near-mesic sites is predominantly Fd and Sxw, with some Bl. Most stems are of good form and vigour. Bl is susceptible to timber value losses due to heart rot when mature, although sound Bl trees >200 years old are not uncommon.

Principal Insect, Disease, and Abiotic Damage Concerns

Armillaria root disease results in growth losses and mortality of Fd stems of a wide range of ages.
White pine weevil causes terminal leader dieback on many young Sxw stems in some plantations.
Spruce beetle damage risks are high in areas of Sxw windthrow and poor harvesting.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >60 m wide) group selection systems;

Canopy present for most stands refers to group selection systems with small and moderate-size (generally 30–60 m wide) harvested groups. **Canopy present** for Fd stands on steep south-facing slopes (/04 site series) refers to a single tree or very small (two to few trees) group selection system. **Canopy present** for wet spruce stands (/08 and /09 site series) also refers to single tree or very small group selection systems.

SBSmh Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd Sxw S:Bl D:Act, At, Ep	***light deficits (vegetation overtop)*** **Fd**, Sxw, **Act**, **At**, **Ep** ***summer frost (gentle slopes)*** Fd	 **Fd**, Sxw, **Act**, **At**, **Ep** ----	high; Mixed hardwood - moist shrub •overtopping vegetation is primarily hardwood tree species and medium and tall shrubs; •hardwoods frequently dominate the site following canopy removal, especially on exposed mineral soil.

•survival and growth of planted **Fd**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and (for **Fd** in partial cuts) if planted in sunny / lightly shaded microsites;
•growth of **Fd** greatest in full sunlight or very light shade;
•although **Pl** is rarely present naturally, survival and early growth of planted **Pl** on cleared sites has been moderate to high;
•natural regeneration ingress of **Fd**, **Sxw**, and **Bl** in partial cuts will follow canopy opening, especially on exposed mineral soil and where abundance of shrubs and deciduous trees is low;
•deciduous tree species (**Act**, **At**, **Ep**) often establish and dominate cleared sites quickly following canopy removal;
•summer frost may reduce survival and early growth of **Fd** on level or gentle slopes in some years with late frosts;
•most **Bl** and **Sxw** is of good form and vigour and can contribute significantly to restocking;
•soils especially susceptible to compaction and rutting when moist.

SBSmh Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd	***moisture deficits***		low; Dry shrub - falsebox
	Pl	**Fd**	**Fd**	
		rooting restrictions (bedrock)		
		nutrient deficits		
	•these sites have low timber productivity; restocking success following logging limited by shallow, droughty soils; •survival and growth of planted **Fd** likely poor due to moisture stress; most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature **Fd**; •survival and growth of planted **Pl** likely moderate; **Pl** natural regeneration generally not an option due to lack of Pl cones; •maintenance of soil organic layers and woody debris are important for long-term site productivity and natural regeneration.			
03	P:Fd	***moisture deficits***		low; Dry shrub - pinegrass
	Pl	Sxw, Bl, Ep	Sxw, Bl, Ep	
	Sxw	***summer frost***		
	S:Bl	Fd	Fd	
	D:At, Ep	***light deficits (vegetation overtop)***		
		----	Pl, At, Ep	
		nutrient deficits		
	•**Pl** natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed, and adequate seedbed present (exposed mineral soil or mixed mineral/organic materials); drag scarification may be required for seedbed management; natural **Pl** regeneration ingress and growth likely reduced in shaded microsites of partial cuts; •survival and growth of planted **Pl** moderate to high on cleared sites; survival generally low in shaded microsites of partial cuts; •survival and growth of planted **Fd** may be poor, due to summer frosts and dryness; likely improved under partial canopy; •survival of planted **Sxw** and **Bl** likely high on cleared and partial-cut sites, but growth poor except in moist microsites; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

SBSmh Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>04</td><td>P:Fd
T:Bl
Sxw
D:At
Ep</td><td><i>moisture deficits</i>
Fd, Bl, Sxw, At, Ep
<i>light deficits (vegetation overtop)</i>
----</td><td>Fd, Sxw, Bl, At, Ep
At</td><td>medium; Mixed shrub - grass
•medium and tall shrubs abundant; expect small to moderate increase in shrub cover following tree canopy clearing.</td></tr>
<tr><td></td><td colspan="4">•most reliable regeneration option for Fd is release of advance regeneration and ingress of natural regeneration under partial canopy of mature Fd; growth of established individual stems generally greatest in full sunlight;
•survival and growth of planted Sxw and Bl likely poor except on moist microsites; survival may be best under partial canopy;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.</td></tr>
<tr><td>05</td><td>P:Fd
Sxw
S:Bl
D:Act, At, Ep</td><td><i>light deficits (vegetation overtop)</i>
Fd, Sxw, Act, At, Ep
<i>summer frost</i>
Fd</td><td>Fd, Act, At, Ep
----</td><td>high; Mixed hardwood - moist shrub
•At, Act, and Ep typically dominate sites following canopy removal, especially on exposed mineral soil.
•medium shrubs often abundant and may increase significantly following tree canopy clearing.</td></tr>
<tr><td></td><td colspan="4">•survival and early growth of planted Fd, Sxw, and Bl likely adequate to regenerate site if competing vegetation (primarily hardwoods and dense medium-height shrubs) is reduced at planting spot;
•advance Bl and Sxw regeneration frequently abundant and often of good form and vigour; can contribute to restocking;
•survival and early growth of Bl may be limited by moose browse damage in local areas;
•natural regeneration ingress of Fd, Sxw, and Bl in partial cuts will follow canopy opening, especially on exposed mineral soil and where abundance of shrubs and deciduous trees is low;
•summer frost may significantly reduce survival and early growth of Fd on gentle slopes in some years with late frosts.</td></tr>
</table>

SBSmh Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Fd Sxw Pl S:Bl D:Act, At, Ep	***light deficits (vegetation overtop)*** **Fd**, Sxw, **Pl**, **Act**, **At**, **Ep** ***summer frost*** Fd	 **Fd**, Sxw, **Pl**, **Act**, **At**, **Ep** ----	high; Mixed shrub - moist shrub medium; Mixed hardwood - moist shrub •shrub cover high in mature stands and often increases significantly following tree canopy removal.
	•survival and growth of planted **Fd**, **Pl**, and **Sxw** likely adequate to restock cleared sites if planted promptly and if competing vegetation is controlled at planting spot; in partial cuts, survival of **Pl** and **Fd** will be reduced in heavily shaded microsites; •frost damage to young **Fd** may be reduced by planting under partial canopy; growth of larger stems greatest in full sunlight; •most advance **Bl** and **Sxw** regeneration is of good form and vigour, and may contribute significantly to restocking; •natural regeneration ingress of **Sxw** and **Pl** will likely restock sites with low vegetation cover and mineral soil exposure near mature stand edges and in partial cuts.			
07	P:Fd Sxw S:Bl D:Act At Ep	***light deficits (vegetation overtop)*** **all species** ***summer frost (gentle slopes)*** Fd ***wet soils (toe slopes)*** Fd	 **all species** ---- Fd	most common: high; Mixed shrub - tall fern less common: high; Mixed hardwood - moist shrub •dense cover of devil's club in mature stands is often quickly replaced by an equally dense cover of moist-site shrubs and tall forbs or hardwood tree species.
	•survival and growth of planted **Fd**, **Sxw**, and **Bl** generally adequate to restock cleared and partial-cut sites if vegetation is controlled at planting spot and large vigorous stock is planted promptly; growth of planted **Fd** likely reduced on toe slopes and in heavily shaded microsites of partial cuts; on toe slopes, growth of all species likely improved on raised microsites; •natural regeneration ingress of **Fd**, **Sxw**, and **Bl** will likely restock sites with low vegetation cover and mineral soil exposure near mature stand edges and in partial cuts; •frost damage to **Fd** may be somewhat reduced by planting on raised microsites and under partial canopy or nurse crop.			

SBSmh Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Fd	***light deficits (vegetation overtop)***		common: high; Mixed shrub - tall fern
	Sxw	**Fd**, **Sxw**, Bl, **Act**,	**Fd**, Sxw, Bl, **Act**,	common: high; Mixed hardwood - moist shrub
	S:Bl	**At**, **Ep**	**At**, **Ep**	less common: medium; Fern - ostrich fern
	D:Act	***summer frost***		•shrub cover often increases significantly following canopy removal; hardwoods frequently dominate the site following canopy removal, especially where mineral soil is exposed.
	At	Fd, Sxw, Bl	Fd	
	Ep	***periodic flooding on some sites***		
	•same as /07 except: •frost damage to **Sxw** and **Bl** will likely occur in some years, but generally not be severe.			
09	P:Sxw	***cold, wet soils***		medium; Mixed shrub - wet forb
	S:Bl	**Sxw**, **Bl**, **Act**	**Sxw**, **Bl**, Act	
	D:Act	***summer frost***		•shrub and herbaceous vegetation increases somewhat following canopy clearing and soil disturbance but is limited by cold, wet soils and thick forest floor.
		Sxw, Bl, Act	**Sxw**, Bl, Act	
		light deficits (vegetation overtop)		
		Act	Sxw, **Act**	
	•low-productivity sites for timber, and difficult to restock after logging; •survival and early growth of planted **Sxw** generally poor, except moderate on raised microsites; •frost damage to **Sxw** may be slightly reduced by planting on raised microsites but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present; •sites very susceptible to soil rutting and compaction; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

SBSmw Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the SBSmw is even-aged management (clearcutting), and the regeneration method is virtually all artificial (planting). Most sites are planted with Pl, Fd, or Sxw depending on site series, previous stand composition, and other factors, and many sites are planted directly without prior site preparation. Plantation success depends on planting promptly following logging. Competing vegetation is most often controlled by spot herbicide application following planting, in which herbicide is applied around the planted tree as necessary. Some sites with vigorous competing vegetation prior to planting have been scarified (planting trails) but this practice is not common currently. A variety of drip or cut and wipe herbicide applications has been used to control competing willows and decidous trees. Broadcast burning is not widely used.

Partial harvest systems experience is virtually nonexistent.

Advance regeneration on mesic and near-mesic sites is predominantly Bl and Sxw, with some Fd on drier sites. Most stems are of good form and vigour. Bl is susceptible to timber value losses due to heart rot when mature, although sound mature Bl are present.

Principal Insect, Disease, and Abiotic Damage Concerns

Armillaria root disease results in growth losses and mortality of Fd stems of a wide range of ages.
White pine weevil causes terminal leader dieback on many young Sxw stems in some plantations.
Spruce beetle is common in mature and old Sxw stands, and typically increases following windthrow or logging damage to residual stems.
Two-year-cycle budworm can cause severe defoliation, especially on regeneration in partially harvested stands.
Warren's root collar weevil and pine teminal weevil may cause moderate to severe damage in Pl plantations, especially those with deep, moist forest floor. Damage is usually not widespread.
Mountain pine beetle is common, and frequently causes mortality in pine stands.
Blister rusts and gall rusts are very common and can cause localized severe damage to Pl plantations.
Tomentosus root rot causes mortality of patches of Sxw and Pl.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >60 m wide) group selection systems;

Canopy present for most stands refers to group selection systems with small and moderate-size (generally 30–60 m wide) harvested groups. **Canopy present** for Fd stands on steep south-facing slopes (/04 site series) refers to a single tree or small group (generally a few trees) selection system. **Canopy present** for wet spruce stands (/09 and /10 site series) also refers to single tree or very small group selection.

SBSmw Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd	***light deficits (vegetation overtop)***		common: medium to high; Mixed shrub - dry shrub
	Pl	**Fd**, **Pl**, Sxw, Act,	Fd, Pl, Sxw,	common: medium to high; Mixed hardwood - willow
	Sxw	At, Ep	Act, At, Ep	•shrub and herbaceous cover often increases significantly within 3–4 years following canopy opening and logging disturbance;
	S:Bl	***summer frost (gentle slopes)***		
	D:Act	Fd	Fd	
	At			•hardwoods readily establish naturally following canopy removal and forest floor disturbance.
	Ep			
	•survival and growth of planted **Fd**, **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared sites if vegetation controlled at planting spot; in partial cuts, survival and growth of **Pl** and **Fd** likely poor to moderate in tree-shaded microsites; •natural regeneration ingress of **Fd**, **Sxw**, and **Bl** will follow canopy opening, especially on exposed mineral soil and where abundance of shrubs and deciduous trees is low; •**Pl** natural regeneration ingress generally not adequate to restock sites due to thick forest floor and dense vegetation; •broadcast burning reduces vegetation competition for 3–4 years.			
02	P:Fd	***moisture deficits***		low; Ericaceous shrub - low shrub
	Pl	**Sxw**, **Bl**, At, Ep	**Sxw**, **Bl**, At, Ep	
	T:Bl	***rooting restrictions (bedrock)***		•shrub and herbaceous cover relatively small and generally develops slowly following logging.
	Sxw	***nutrient deficits***		
	D:At, Ep			
	•low productivity for trees, especially **Sxw** and **Bl**; •survival and growth of planted **Pl** and **Fd** generally adequate to restock site if planted in pockets of deeper soils; •**Pl** natural regeneration will generally restock cleared sites if sufficient cones present and well distributed; **Fd** natural regeneration common on microsites with deeper soils under Fd partial canopy; •planted **Sxw** and **Bl** may contribute to restocking of moist microsites; •maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.			

SBSmw Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Fd	***moisture deficits***		low to medium; Ericaceous shrub - low shrub
	Pl	Bl, Sxw	Bl, Sxw	
	T:Bl	***summer frost***		•vegetation development following logging and site preparation limited by dry, nutrient-poor soils.
	Sxw	Fd, Sxw, Bl	Fd, Sxw, Bl	
	D:At	***light deficits (vegetation overtop)***		
		----	Fd, Pl, At	
		nutrient deficits		

•survival and growth of planted **Pl** generally sufficient to restock sites without vegetation control;
•survival of planted **Fd** generally poor, due to summer frost; may be improved somewhat with high canopy retention;
•survival and growth of planted **Sxw** and **Bl** generally poor, due to moisture stress and summer frost;
•successful natural **Pl** regeneration generally requires scarification (logging or site preparation) to create suitable seedbed;
•summer frost injury to **Sxw** and **Bl** may be reduced by planting beneath a Pl partial canopy;
•maintenance of soil organic layers and woody debris important for long-term site productivity and natural regeneration.

SBSmw Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>04</td><td>P:Fd</td><td colspan="2"><i>moisture deficits (south aspects)</i></td><td>low (S and W aspects) to medium (N and E aspects); Dry</td></tr>
<tr><td></td><td>Pl</td><td>Fd, Sxw, Bl, Ep</td><td>Fd, Sxw, Bl, Ep</td><td>shrub - falsebox</td></tr>
<tr><td></td><td>Sxw</td><td colspan="2"><i>moisture deficits (shallow soils on slope</i></td><td></td></tr>
<tr><td></td><td>S:Bl</td><td colspan="2"><i>crests and north aspects)</i></td><td>•increase in vegetation following canopy opening relatively</td></tr>
<tr><td></td><td>D:At</td><td>Sxw, Bl</td><td>Sxw, Bl</td><td>small and slow due to dry soils;</td></tr>
<tr><td></td><td>Ep</td><td colspan="2"><i>light deficits</i></td><td>•advance Bl regeneration often dense on cool aspects.</td></tr>
<tr><td></td><td></td><td>----</td><td>Fd, Pl, At, Ep</td><td></td></tr>
<tr><td></td><td colspan="4">•growth of Sxw and Bl limited by moisture stress, especially on clearcut S- and W-facing slopes;
•survival and growth of planted Pl and Fd generally adequate to restock cleared or partial-cut sites without vegetation control, except on some north aspects with dense Bl advance regeneration;
•Fd natural regeneration ingress generally common on exposed mineral soils under Fd partial canopy;
•Pl natural regeneration likely adequate to restock sites if sufficient cones present and well distributed on mineral soil.</td></tr>
<tr><td>05</td><td>P:Pl</td><td colspan="2"><i>summer frost</i></td><td>medium to high; Mixed shrub - pink spirea</td></tr>
<tr><td></td><td>Sxw</td><td>Sxw, Bl</td><td>Sxw, Bl</td><td></td></tr>
<tr><td></td><td>S:Bl</td><td colspan="2"><i>cold, wet soils</i></td><td>•high to very high cover of shrubs present prior to timber</td></tr>
<tr><td></td><td>D:Act</td><td>all species</td><td>all species</td><td>harvesting increases following canopy opening.</td></tr>
<tr><td></td><td></td><td colspan="2"><i>light deficits (vegetation overtop)</i></td><td></td></tr>
<tr><td></td><td></td><td>Pl, Sxw, Bl, Act</td><td>Pl, Sxw, Bl, Act</td><td></td></tr>
<tr><td></td><td colspan="4">•sites moderately difficult to reforest due to cold, moist to wet soils and very frequent summer frost;
•survival and growth of planted Pl generally adequate to restock cleared and partial-cut sites if vegetation controlled at planting spot and if planted in sunny microsites; on wettest sites, successful restocking usually requires planting on raised microsites;
•survival and growth of Sxw and Bl generally poor, but may be somewhat improved by planting on raised microsites;
•natural regeneration of all species poor, due to cold, wet soils, thick forest floors, and competing vegetation.</td></tr>
</table>

SBSmw Site Series - Silviculture Considerations (continued)

<table>
<tr><th rowspan="2">Site series</th><th rowspan="2">Ecologically adapted tree species</th><th colspan="2">Principal site factors limiting tree establishment and early growth</th><th rowspan="2">Vegetation potential and complex</th></tr>
<tr><th>No or limited canopy</th><th>Canopy present</th></tr>
<tr><td>06</td><td>P:Fd
Pl
Sxw
S:Bl
D:Act</td><td><i>light deficits (vegetation overtop)</i>
Fd, Pl, Sxw, Bl, Act
<i>summer frost (gentle slopes)</i>
Fd</td><td>
Fd, Pl, Sxw, Bl, Act

Fd</td><td>high; Mixed shrub - moist forb
•vegetation cover increases more quickly and abundantly than in /01 site series following canopy opening and site preparation.</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Pl, Sxw, and Bl generally adequate to restock cleared sites if vegetation controlled at planting spot; in partial cuts, survival and growth of Pl likely poor to moderate in tree-shaded microsites;
•survival and growth of planted Fd generally poor on gentle slopes, but moderate on steeper slopes if vegetation is controlled;
•natural regeneration ingress of Fd, Sxw, and Bl will occur near mature stand edges and in partial cuts after canopy opening if vegetation cover is low and mineral soil is exposed.</td></tr>
<tr><td>07</td><td>P:Sxw
S:Bl
Pl</td><td><i>light deficits (vegetation overtop)</i>
all species
<i>summer frost</i>
Sxw, Bl
<i>cold, moist soils</i></td><td>
all species

Sxw, Bl</td><td>high; Mixed shrub - moist shrub
•vigorous shrub layer usually present; shrub cover and height usually increase following canopy opening.</td></tr>
<tr><td></td><td colspan="4">•survival and growth of planted Sxw, Bl, and Pl generally adequate to restock cleared sites if vegetation controlled at planting spot and if planted on exposed mineral soil or on raised microsites;
•in partial cuts, survival and growth of planted Pl likely poor to moderate in tree-shaded microsites;
•natural regeneration ingress of all species poor, due to cold soils and competing vegetation;
•frost damage to Sxw and Bl may be reduced by planting on raised microsites, under partial canopy, or as part of Pl-dominated mixture, but benefits may be overwhelmed by cold air accumulation if large upslope cold air source is present;
•Bl advance regeneration >25 cm tall mostly of poor form and vigour.</td></tr>
</table>

SBSmw Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Sxw	***light deficits (vegetation overtop)***		high; Mixed shrub - tall fern
	Fd	**all species**	**all species**	
	S:Bl	***summer frost (toe slopes)***		•shrub and herbaceous vegetation is vigorous; cover and height of vegetation generally increases following canopy opening; devil's club usually declines significantly following canopy opening but other shrubs and some forbs, ferns, and grasses increase.
	Pl	Sxw, **Fd**, Bl	Sxw, **Fd**, Bl	
	D:Act	***cold, wet soils***		
	At	Fd, At	Fd, At	
	Ep			

- survival and growth of planted **Sxw**, **Fd**, **Pl**, and **Bl** generally adequate to restock cleared sites if vegetation is controlled at planting spot and large vigorous stock is planted promptly; growth of planted **Fd** likely reduced on toe slopes; growth of all species on toe slopes likely improved on raised microsites;
- survival and growth of planted **Pl** poor, and of **Fd** poor to moderate, on shaded microsites of partial cuts (with control of shrub and herbaceous vegetation); **Sxw** and **Bl** most suitable for shaded microsites;
- natural regeneration ingress of **Fd**, **Sxw**, and **Bl** will likely restock sites with low vegetation cover and mineral soil exposure near mature stand edges and in partial cuts;
- frost damage to **Sxw**, **Fd**, and **Bl** may be somewhat reduced by planting on raised microsites or under partial canopy.

SBSmw Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
09	P:Sxw S:Bl Pl D:Act	***summer frost*** **Sxw**, **Bl**, Pl, Act ***cold, wet soils*** **all species** ***light deficits (vegetation overtop)*** Sxw, Pl, Act	 **Sxw**, **Bl**, Pl, Act **all species** **Sxw**, **Pl**, Act	medium; Mixed shrub - wet forb •small patches of Wet alder - fern vegetation is often present; •vegetation development limited by cold, wet soils and thick soil organic layers.
	•low-productivity sites for timber, and difficult to restock after logging; •survival and early growth of planted **Sxw**, **Bl**, and **Pl** generally poor, except moderate on raised microsites; •**Pl** is not common on these sites; Pl growth to maturity not well adapted to sites with near-surface water table; •frost damage to **Sxw** may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present; •sites very susceptible to soil rutting and compaction; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			
10	P:Pl Sxw T:Sb	***summer frost*** Pl, **Sxw** ***cold, wet soils*** **Pl**, **Sxw**, Sb	 Pl, **Sxw** **Pl**, **Sxw**, Sb	medium; Mixed shrub - sphagnum •vegetation development limited by cold, wet soils and thick soil organic layers.
	•comments under /09 above generally apply; •growth of **Sb** slow, and value for timber production very low.			

SBSwk1 Silviculture Considerations

Silviculture Practices and Options

Predominant silviculture system in the SBSwk1 is even-aged management (clearcutting), and the regeneration method is virtually all artificial (planting). Most sites are planted with Pl, Sxw, or Pl/Sxw mixtures. Mixing Sxw with Pl reduces the risk of white pine weevil damage and frost injury to Sxw. Some sites have been broadcast burned prior to planting, but mesic and drier sites are often planted without site preparation as long as they can be planted promptly following logging. Competing vegetation may be controlled as necessary by spot herbicide application around the planted tree. Some sites with vigorous competing vegetation prior to planting have been scarified (planting trails) but this practice is not common currently. Wet sites are usually planted with Sxw, often on artificially created mounds.

Principal crop tree species are Sxw and Pl. Fd occurs locally on steep south-facing slopes, but is common only near the SBSmw boundary.

Partial harvest system experience is virtually nonexistent.

Advance regeneration on mesic and near-mesic sites is predominantly Bl and Sxw. Most Sxw stems and many of the younger Bl stems are of good form and vigour.

Principal Insect, Disease, and Abiotic Damage Concerns

Summer frost may reduce growth and result in mortality of Sxw stems, especially on gentle lower slopes and depressions.
White pine weevil has caused terminal leader dieback in some Sxw plantations.
Black army cutworm defoliates young Sxw and Pl seedlings, usually only for one season, on some recently burned sites.
Tomentosus root rot, laminated root rot, and Armillaria root disease reduce growth and result in mortality of young or immature Pl and Sxw. Damage may be increased by partial harvesting.
Spruce beetle damage risk is high, especially in valley bottoms and in the vicinity of windthrow and poor logging.
Two-year-cycle budworm can cause severe defoliation, especially on regeneration in partially harvested stands.
Blister rusts and gall rusts are common and can cause localized severe damage to regenerating Pl stands.
Douglas-fir beetle causes localized spot mortality of Fd stems.

Silviculture Considerations Table — Harvest Assumptions

No or limited canopy refers to clearcuts and larger patch (generally >60 m wide) group selection systems;

Canopy present for most stands refers to group selection systems with small to moderate-size (generally 30–60 m wide) harvested groups. **Canopy present** for wet spruce stands (/09 and /11 site series) refers to single tree or very small (two to few trees) group selection.

SBSwk1 Site Series - Silviculture Considerations

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
01	P:Fd (near SBSmw)	***summer frost***		medium (S and W aspects) to high (N and E aspects); Mixed shrub - moist forb
		Fd	Fd	
	Pl	***light deficits (vegetation overtop)***		
	Sxw	**Fd**, **Pl**, Sxw, **Act**	**Fd**, **Pl**, Sxw, **Act**	•shrub cover often increases significantly 3–4 years following logging; burning reduces shrubs, but herbaceous cover usually well developed within 3–4 years, especially on N aspects, after broadcast burning.
	S:Bl	***snowpress***		
	D:Act			

- survival and growth of planted **Pl**, **Sxw**, and **Bl** generally adequate to restock clearcut sites if vegetation controlled at planting spot; in partial cuts, survival and growth of **Pl** likely poor in tree-shaded microsites;
- survival and growth of planted **Fd** generally poor, except on steeper slopes in western portions of SBSwk1, near the SBSmw;
- prompt planting following harvesting / site preparation will improve restocking success;
- **Pl** natural regeneration ingress rates poor due to thick forest floor, dense shrub and herb vegetation, and cool temperatures;
- natural regeneration ingress of **Sxw** and **Bl** will likely restock sites with low vegetation cover and exposed mineral soil near mature stand edges and in partial cuts;
- broadcast burning reduces above-ground vegetation for 3–4 years, depending on intensity of burn and slope aspect;
- snowpress damage greatest where tall herbaceous vegetation is abundant;
- advance **Bl** <25 cm tall is generally of good form and vigour, and its growth releases following canopy opening.

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
02	P:Fd (near SBSmw)	***moisture deficits***		low to medium; Ericaceous shrub - low shrub
		Sxw, Bl	Sxw, Bl	
	Pl	***light deficits***		•shrub and herbaceous cover generally develops slowly following logging and is less vigorous than in /01 site series.
	T:Bl	----	Pl	
	Sxw	***rooting restrictions (bedrock)***		
		nutrient deficits		

- •survival and growth of planted **Pl** generally adequate to restock cleared sites if planted in microsites with relatively deep soil;
- •survival and growth of planted **Sxw** and **Bl** generally poor to moderate due to moisture stress; best in deeper soil;
- •**Pl** natural regeneration generally adequate to restock cleared and partial-cut sites if sufficient numbers of cones present and well distributed; scarification generally not required but may increase ingress rate; establishment and growth likely poor in tree-shaded microsites of partial cuts;
- •**Fd** natural regeneration generally adequate to restock sites on deeper soil microsites under partial Fd canopy;
- •maintenance of soil organic layers and woody debris important for long-term nutrient availability and natural regeneration.

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
03	P:Fd (near SBSmw)	***moisture deficits***		medium; Ericaceous shrub - low shrub
		Bl, Sxw	Bl, Sxw	
	Pl	***summer frost (terraces)***		•vegetation development following logging and site preparation limited by dry, nutrient-poor soils.
	T:Bl	**Fd**, Sxw, Bl	**Fd**, Sxw, Bl	
	Sxw	***nutrient deficits (sand soils)***		
		Fd	Fd	
		light deficits		
		----	Pl, Fd	

•survival and early growth of planted **Pl** usually adequate to restock site without vegetation control; in partial cuts, survival and growth likely poor in tree-shaded microsites;

•survival and growth of planted **Sxw** and **Bl** generally poor to moderate due to moisture stress; may be somewhat improved under partial canopy and by mineral soil exposure;

•Pl natural regeneration ingress is very limited by deep soil organic layers; scarification generally required;

•advance **Bl** <25 cm tall is generally of good form and vigour, and growth releases following canopy opening;

•maintenance of soil organic layers and woody debris important for long-term nutrient availability and natural regeneration.

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
04	P:Fd Pl Sxw S:Bl D:At, Ep	***moisture deficits*** **Sxw**, **Bl**, Ep ***light deficits*** ----	 Sxw, Bl, Ep **Pl**, **At**, Ep	medium; Mixed shrub - dry shrub •increase in vegetation following tree canopy removal relatively small and slow due to dry soils.
	•**Fd** more common on these than on other sites of SBSwk1, but occurs mostly near SBSmw boundary; •survival of planted **Pl** and **Fd** generally moderate to high on cleared sites without vegetation control, but poor in tree-shaded microsites of partial cuts; **Fd** survival may be poor on all sites at higher elevations; •**Pl** natural regeneration generally adequate to restock cleared sites if sufficient numbers of cones present and well distributed on exposed mineral soil or mixed mineral/organic materials; scarification may be required on some sites; •survival of planted **Sxw** and **Bl** moderate to high without vegetation control, but growth slow due to moisture stress; •**Fd** natural regeneration ingress generally adequate to restock sites with partial Fd canopy.			
05	P:Pl Sxw S:Bl	***light deficits (vegetation overtop)*** Pl ***moisture deficits*** Sxw, Bl	 **Pl** ----	medium; Mixed shrub - dry shrub •shrub and herbaceous vegetation development following canopy clearing less vigorous and slower than in /01 site series.
	•survival and growth of planted **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared sites if vegetation controlled at planting spot; in partial cuts, **Pl** survival likely poor in tree-shaded microsites; •**Pl** natural regeneration limited by thick soil organic layers; scarification generally required; •**Sxw** and **Bl** natural regeneration will generally establish near mature stand edges, and in partial cuts where vegetation cover is low and mineral soil is exposed; •advance **Sxw** and **Bl** regeneration <25 cm tall is often of good form and vigour; growth releases following canopy opening.			

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
06	P:Pl	***summer frost***		medium to high; Mixed shrub - pink spirea
	Sxw	**Sxw**, **Bl**	**Sxw**, **Bl**	
	S:Bl	***cold, moist soils***		•cover of shrubs typically increases following canopy opening;
	D:Act	Pl, **Sxw**, **Bl**	Pl, **Sxw**, **Bl**	•shrub cover variable, greatest on wettest sites.
		light deficits (vegetation overtop)		
		all species	**all species**	
	•sites difficult to restock due to cold, moist soils and frequent summer frost; •survival and growth of planted **Sxw** and **Bl** generally poor, due to severe frost and cold soils; may be somewhat improved on raised microsites where vegetation cover is reduced and soils are warmed; •planted **Pl** survival likely moderate on raised microsites where vegetation is controlled; •soils very susceptible to compaction and rutting.			
07	P:Pl	***light deficits (vegetation overtop)***		high; Mixed shrub - moist shrub
	Sxw	**all species**	**all species**	
	S:Bl	***summer frost (gentle slopes)***		•vigorous and nearly continuous cover of shrubs usually present in mature stands; cover and height usually increase following canopy opening; if dominant shrubs controlled, they are often quickly replaced by other species.
	D:Act	**Sxw**, **Bl**, **Ep**	Sxw, Bl, Ep	
	At	***cold, wet soils***		
	Ep	Pl, Sxw, **At**, **Ep**	Pl, Sxw, **At**, **Ep**	
	•survival and growth of planted **Pl**, **Sxw**, and **Bl** generally adequate to restock cleared sites if planted on raised microsites and if vegetation is controlled at planting spot; **Pl** survival likely poor in partial cuts; •**Sxw** and **Bl** natural regeneration may partially restock site, but full stocking not reliable due to frost and competing vegetation; •**Bl** advance regeneration <25 cm tall and most **Sxw** is of good form and vigour, and releases following canopy opening; •frost damage to **Sxw** and **Bl** may be somewhat reduced by planting on raised microsites and under partial canopy; •**At** and **Ep** best adapted to climates near SBSmw boundary.			

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
08	P:Sxw	***light deficits (vegetation overtop)***		high; Mixed shrub - tall fern
	S:Bl	**all species**	**all species**	•vigorous shrub and herbaceous vegetation; cover and height of vegetation generally increases following canopy opening; devil's club generally declines following canopy opening but other shrubs and some forbs increase; lady fern is characteristic.
	Pl	***summer frost (gentle slopes)***		
	D:Act	Sxw, Bl	----	
	At			
	Ep			
	•survival and growth of planted **Sxw** and **Bl** is generally high on cleared sites if shrub and herb vegetation is controlled; •in partial cuts, survival of planted **Pl** poor to moderate, and of **Sxw** and **Bl** moderate to high, if shrubs and herbs controlled; •natural regeneration ingress of all species generally poor, due to competing shrub and herbaceous vegetation; •soils are very susceptible to compaction and rutting when not frozen.			
09	P:Sxw	***summer frost***		medium; Mixed shrub - wet forb
	S:Bl	**Sxw**, **Bl**, Pl, Act	**Sxw**, **Bl**, Pl, Act	
	Pl	***cold, wet soils***		•vegetation development limited by cold, wet soils and thick soil organic layers.
	D:Act	**all species**	**all species**	
		light deficits (vegetation overtop)		
		Sxw, Pl, Act	Sxw, **Pl**, **Act**	
	•low-productivity sites for timber, and difficult to restock after logging; •survival and early growth of planted **Sxw** generally poor, except moderate on raised microsites; •**Pl** is not common on these sites; Pl growth to maturity not well adapted to sites with near-surface water table; •frost damage to **Sxw** may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present; •sites very susceptible to soil rutting and compaction; •trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.			

SBSwk1 Site Series - Silviculture Considerations (continued)

Site series	Ecologically adapted tree species	Principal site factors limiting tree establishment and early growth		Vegetation potential and complex
		No or limited canopy	Canopy present	
11	P:Pl	***summer frost***		medium; Mixed shrub - sphagnum
	Sxw	Sxw, Pl	Sxw, Pl	
	T:Sb	***cold, wet soils***		•vegetation development limited by cold, wet organic soils.
		Sxw, **Pl**, Sb	Sxw, **Pl**, Sb	

•very low productivity sites for timber, and very difficult to restock after logging;
•survival and early growth of planted **Sxw** generally poor, except moderate on raised microsites;
•**Pl** is not common on these sites; **Pl** growth to maturity not well adapted to sites with near-surface water table;
•**Sb** growth very slow, and value for timber very low;
•frost damage to **Sxw** may be slightly reduced by planting on raised microsites, but benefits likely overwhelmed by cold air accumulation if large upslope cold air source is present;
•trees with large, dense crowns exposed to winds by logging generally very susceptible to windthrow.

8 LITERATURE CITED

Allen, E.A., D.J. Morrison, and G.W. Wallis. 1996. Common tree diseases of British Columbia. Nat. Resour. Can., Can. For. Serv., Victoria, B.C.

Annas, R.M. and R. Coupé (editors). 1979. Biogeoclimatic zones and subzones of the Cariboo Forest Region. B.C. Min. For., Williams Lake, B.C.

Armleder, H.M., R.J. Dawson, and R.N. Thomson. 1986. Handbook for timber and mule deer management co-ordination on winter ranges in the Cariboo Forest Region. B.C. Min For., Victoria, B.C. Land Manage. Handb. No. 13.

Bancroft, B. 1996. Fundamentals of natural lodgepole pine regeneration and drag scarification. B.C. Min. For., Victoria, B.C.

Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 26.

Braumandl, T. and M.P. Curran. 1992. A field guide for site identification and interpretation in the Nelson Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 20.

British Columbia Forest Practices Branch. 1997a. Dry alder complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

—. 1997b. Ericaceous shrub complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

—. 1997c. Fireweed Complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

—. 1997d. Mixed-shrub complex. (Operational summary for vegetation management.)B.C. Min. For., Victoria, B.C.

—. 1997e. Pinegrass complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

—. 1997f. Wet alder complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

—. 1997g. Willow complex. (Operational summary for vegetation management.) B.C. Min. For., Victoria, B.C.

British Columbia Ministry of Forests and BC Environment. 1995a. Forest practices code of British Columbia - establishment to free growing guidebook. B.C. Min. For. and B.C. Environ., Victoria, B.C.

—. 1995b. Forest practices code of British Columbia - site preparation guidebook. B.C. Min. For. and B.C. Environ., Victoria, B.C.

—. 1995c. Forest practices code of British Columbia - silvicultural systems guidebook. B.C. Min. For. and B.C. Environ., Victoria, B.C.

—. 1995d. Forest practices code of British Columbia - biodiversity guidebook. B.C. Min. For. and B.C. Environ., Victoria, B.C.

Burton, G.D. 1992. Alternatives to prescribed burning. B.C. Min. For., Victoria, B.C.

Carr, W.W., W.R. Mitchell, and W.J. Watt. 1991. Basic soil interpretations for forest development planning; surface soil erosion and soil compaction. B.C. Min. For., Victoria, B.C. Land Manage. Rep. No. 63.

Coates, D. and S. Haeussler. 1987. A guide to the use of mechanical site preparation equipment in north central British Columbia. 2nd ed. B.C. Min. For. and Northern Silv. Comm., Victoria, B.C. FRDA Handb. No. 002.

Coates, D., S. Haeussler, and J. Mather. 1990. A guide to response of common plants in British Columbia to management treatments. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Handb. No. 008.

Comeau, P., G.J. Harper, M.E. Blache, J.O. Boateng, and L.A. Gilkeson (editors). 1996. Integrated forest management options and applications. B.C. Min. For. and For. Can., Victoria, FRDA Report No. 251.

Coupé, R., A.C. Stewart and B.M. Wikeem. 1991. Engelmann Spruce–Subalpine Fir Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Special Report Series 6. Chap. 15, pp. 223-236.

Delong, C., D. Tanner, and M. Jull. 1993. A field guide to site identification and interpretation for the southwest portion of the Prince George Forest Region, B.C. Min. For., Victoria, B.C., B.C. Land Manage. Handb. No. 24.

Douglas, G.W., G.B. Straley, and D. Meidinger. 1989. The vascular plants of British Columbia. Part 1. Gymnosperms and Dicotyledons (Aceraceae through Cucurbitaceae). B.C. Min. For., Victoria, B.C. Special Report Series 1.

—. 1990. The vascular plants of British Columbia. Part 2. Dicotyledons (Diapensiaceae through Portulaceae). B.C. Min. For., Victoria, B.C. Special Report Series 2.

—. 1991. The vascular plants of British Columbia. Part 3. Dicotyledons (Primulaceae through Zygophyllaceae) and Pteriodophytes. B.C. Min. For., Victoria, B.C. Special Report Series 3.

—. 1993. The vascular plants of British Columbia. Part 4. Monocotyledons. B.C. Min. For., Victoria, B.C. Special Report Series 4.

Farnden, C. 1994. Forest regeneration in the ESSF zone of north-central British Columbia. Can. For. Serv., Infor. Rep. BC-X-351.

Finck, K.E., P. Humphreys, and G.V. Hawkins. 1992. Field guide to pests of managed forests in British Columbia. B.C. Min. For. and For. Can., Victoria, B.C. Joint Rep. No. 16. Revised.

Green, R.N., R.L. Trowbridge, and K. Klinka. 1993. Towards a taxonomic classification of humus forms. For. Sci. Monogr. 29 (Suppl. to For. Sci. 39(1)).

Green, R.N. and K. Klinka. 1994. A field guide to site identification and interpretation for the Vancouver Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 28.

Haeussler, S., D. Coates, and J. Mather. 1990. Autecology of common plants in British Columbia. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Rep. No. 158.

Hamilton, E. 1988. A system for the classification of seral ecosystems within the biogeoclimatic ecosystem classification. First approx. B.C. Min. For. and Lands, Victoria, B.C. Res. Rep. RR87004-HQ.

Hansen, A.J., T.A. Spies, F.J. Swanson, and J.L. Ohmann. 1991. Conserving biodiversity in managed forests. BioScience 41(6):382-392.

Holland, S.S. 1976. Landforms of British Columbia: a physiographic outline. 2nd ed. B.C. Dep. Mines, Mineral Resources, Victoria, B.C. Bull. No. 48.

Hope, H.D., W.R. Mitchell, D.A. Lloyd, W.R. Erickson, W.L. Harper, and B.M. Wikeem. 1991. Interior Douglas-fir Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Special Report Series 6. Chap. 10, pp. 153-166.

Hunter, M.L. Jr. 1990. Wildlife, forests, and forestry; principles of managing forests for biological diversity. Prentice Hall Inc., Englewood Cliffs, N.J.

Ireland, R.R., G.R. Brassard, W.B. Schofield, and D. H. Vitt. 1987. Checklist of the mosses of Canada II. Lindbergia 13:1-62.

Jungen, J.R. and T. Lewis. 1978. The Coast Mountains and islands. *In* The soil landscapes of British Columbia. K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (editors). B.C. Min. Environ., Victoria, B.C. pp. 101-120.

Ketcheson, M.V., T.F. Braumandl, D. Meidinger, G. Utzig, D.A. Demarchi, and B.M. Wikeem. 1991. Interior Cedar–Hemlock Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Special Report Series 6. Chap. 11, pp. 167-182.

Klinka, K., M.C. Feller, R.N. Green, D.V. Meidinger, J. Pojar, and J. Worrall. 1990. Ecological principles: applications. *In* Regenerating British Columbia's forests. D.P. Lavender, R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). Univ. B.C. Press, Vancouver, B.C.

Klinka, K., R.N. Green, R.L. Trowbridge, and L.E. Lowe. 1981. Taxonomic classification of humus forms in ecosystems of British Columbia. B.C. Min. For., Victoria, B.C. Land Manage. Rep. No. 8.

Krajina, V.J. 1965. Biogeoclimatic zones and biogeocoenoses of British Columbia. Ecol. West. N. Amer. 1:1-17.

Lavender, D.P. 1990. Physiological principles of regeneration. *In* Regenerating British Columbia's forests. D.P. Lavender, R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). Univ. B.C. Press, Vancouver, B.C.

Lavender, D.P., R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors) 1990. Regenerating British Columbia's forests. For. Can. and B.C. Min. For., Univ. B.C. Press, Vancouver, B.C.

Lewis, T., W.W. Carr, and Timber Harvesting Subcommittee. 1989. Developing timber harvesting prescriptions to minimize site degradation: interior sites. B.C. Min. For., Victoria, B.C. Land Manage. Handb. Field Guide Insert.

Lewis, T. and Timber Harvesting Subcommittee. 1991. Developing timber harvesting prescriptions to minimize site degradation. B.C. Min. For., Victoria, B.C. Land Manage. Rep. 62.

Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 23.

Lord, T.M. 1984. Soils of the Horsefly area, British Columbia. B.C. Soil Survey. Can. Dep. Agric., Vancouver, B.C. Rep. No. 32.

Luttmerding, H.A., D.A. Demarchi, E.C. Lea, D.V. Meidinger, and T. Vold (editors). 1990, Describing ecosystems in the field. 2nd ed. B.C. Min. Environ., Victoria, B.C. Manual No. 11.

MacKinnon, A., D. Meidinger, and K. Klinka. 1992. Use of the biogeoclimatic ecosystem classification system in British Columbia. For Chron. 68:100-120.

MacKinnon, A., J. Pojar, and R. Coupé (editors). 1992. Plants of northern British Columbia. B.C. Min. For. and For. Can. Lone Pine Pub., Edmonton, Alta.

Meidinger, D. (compiler). 1987. Recommended vernacular names for common plants of British Columbia. B.C. Min. For. and Lands. Res. Rep. RR87002. Victoria, B.C. Revised 1988.

Meidinger, D.V. and J. Pojar (editors). 1991. Ecosystems of British Columbia. B.C. Min. For., Victoria, B.C. Special Rep. Series No. 6.

Meidinger, D., J. Pojar, and W.H. Harper. 1991. Sub-Boreal Spruce Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Spec. Rep. Ser. 6. Chap. 14, pp. 209-222.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, New York, N.Y.

Newsome, T. 1996. The use of sheep in forest vegetation management. *In* Integrated forest management options and applications. P. Comeau, G.J. Harper, M.E. Blache, J.O. Boateng, and L.A. Gilkeson (editors). B.C. Min. For. and For. Can., Victoria, B.C. FRDA Report No. 251. pp. 67-74.

Newton, M. and P.G. Comeau. 1990. Control of competing vegetation. *In* regenerating British Columbia's forests. D.P. Lavender. R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). Univ. B.C. Press, Vancouver, B.C. Chap. 19, pp. 256-265.

Nicholson, A.C. and E. Hamilton. 1984. A problem analysis of grassland classification in the British Columbia Ministry of Forests ecosystems classification program. Min. For., Victoria, B.C. (Unpubl. report).

Nicholson, A.C., E. Hamilton, W.L. Harper, and B.M.Wikeem. 1991. Bunchgrass zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For, Victoria, B.C. Spec. Rep. Ser. 6, pp. 125-137.

Nicholson, A.C., A. McLean, and T.E. Baker. 1982. Grassland ecology and classification. Symp. Proc. B.C. Min. For., Victoria, B.C.

Noble, W.J., T. Ahti, G.F. Otto, and I.M. Brodo. 1987. A second checklist and bibliography of lichens and allied fungi of British Columbia. Syllogeus 61, National Museums of Canada, Ottawa, Ont.

Otchere-Boateng, J. and G. Ackerman. 1990. A guide to vegetation control equipment. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Handb. No. 005.

Parish, R., R. Coupé, and D. Lloyd (editors). 1996. Plants of southern interior British Columbia. Lone Pine Publ., Edmonton, Alta.

Park, A. and L. McCulloch. 1993. Guidelines for maintaining biodiversity during juvenile spacing. B.C. Min. Environ. and For. Can., Victoria, B.C.

Pojar, J., K. Klinka and D.A. DeMarchi. 1991b. Coastal Western Hemlock zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For, Victoria, B.C. Spec. Rep. Ser. 6, pp. 95-111.

Pojar, J., K. Klinka, and D.V. Meidinger. 1987. Biogeoclimatic ecosystem classification British Columbia. For. Ecol. and Manage. 22:119-154.

Pojar, J. and D. Meidinger, 1991. British Columbia: the environmental setting. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Spec. Rep. Ser. 6. Chap. 3, pp. 33-67.

Pojar, J., D. Meidinger, and K. Klinka. 1991a. Concepts. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Spec. Rep. Ser. 6, pp. 9-37

Pojar, J. and A.C. Stewart. 1991. Alpine Tundra Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Spec. Rep. Ser. 6. Chap. 18, pp. 223-262.

Research Section, Cariboo Forest Region. 1982. A field guide for the identification and interpretation of ecosystems of the Cariboo Forest Region (E.P. 822.04). Unpubl. draft, revised 1989. B.C. Min. For., Cariboo Forest Region, Williams Lake, B.C.

Roberts, A. 1984. Guide to wetland ecosystems of the Sub-Boreal Spruce a Subzone, Cariboo Forest Region, British Columbia. Unpubl. rep., Res. Section, Cariboo Forest Region, Williams Lake, B.C.

Ryder, J.M. 1978. Geology, landforms and surficial materials. *In* The soil landscapes of British Columbia. K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (editors). B.C. Min. Environ., Victoria, B.C. pp. 11-33.

Schaefer, D.G. 1978. Climate. *In* The soil landscapes of British Columbia. K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (editors). B.C. Min. Environ., Victoria, B.C. pp. 3-10.

Silviculture Interpretations Working Group. 1992. Correlated guidelines for management of uneven-aged drybelt Douglas-fir stands in British Columbia (1st approx.). B.C. Min. For., Victoria, B.C.

—. 1993. Correlated guidelines for tree species selection (1st approx.) and stocking standards (2nd approx.) for ecosystems of British Columbia. B.C. Min. For. and For. Can., Victoria, B.C.

Stathers, R.J. 1989. Summer frost in young plantations. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Rep. 073.

Stathers, R.J. and D.L. Spittlehouse. 1990. Forest soil temperature manual. B.C. Min. For. and For. Can., Victoria, B.C.

Stathers, R.J., R. Trowbridge, D.L. Spittlehouse, A. Macadam, and J.P. Kimmins. 1990. Ecological principles: basic concepts. *In* regenerating British Columbia's forests. D.P. Lavender, R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). Univ. B.C. Press, Vancouver, B.C. Chap. 5, pp. 45-54.

Steen, O.A. and D.A. Demarchi. 1991. Sub-boreal Pine–Spruce Zone. *In* Ecosystems of British Columbia. D. Meidinger and J. Pojar (editors). B.C. Min. For., Victoria, B.C. Spec. Rep. Ser. 6. Chap. 13, pp. 195-207.

Steen, O.A and A.L. Roberts. 1988. Guide to wetland ecosystems of the Very Dry Interior Douglas-fir subzone, eastern Fraser Plateau variant (IDFb2) in the Cariboo Forest Region. B.C. Min. For. and Lands, Victoria, B.C. Land Manage. Rep. No. 55.

Steen, O.A and A. Smith. 1991. Grass and legume seeding for vegetation control on blade scarified sites in the ICH and ESSF zones in the central interior of British Columbia. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Rep. 182.

Steen, O.A., R.J. Stathers, and R.A. Coupé. 1990. Identification and management of summer frost-prone sites in the Cariboo Forest Region. B.C. Min. For. and For. Can., Victoria, B.C. FRDA Rep. 157.

Stotler, R. and B. Crandall-Stotler. 1977. A checklist of liverworts and hornworts of North America. The Bryologist 80:405-428.

Thompson, C. and O. Steen. 1996. Cover crops for forest vegetation management. *In* Integrated forest vegetation management: options and applications. P.G. Comeau, G.L. Harper, M.E. Blache, J.O. Boateng, and L. Gilkeson (editors). B.C. Min. For. and For. Can., Victoria, B.C. FRDA Rep. 251.

Trowbridge, R., B. Hawkes, A. Macadam, and J. Parminter. 1986. Field handbook for prescribed fire assessment in B.C.: logging slash fuel. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 11.

Valentine, K.W.G. and A.B. Dawson. 1978. The interior plateau. *In* The soil landscapes of British Columbia. K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (editors). B.C. Min. Environ., Victoria, B.C. pp. 121-134.

Wittneben, U. and L. Lacelle. 1978. The Columbia Mountains and southern Rockies. *In* The soil landscapes of British Columbia. K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (editors). B.C. Min. Environ., Victoria, B.C. pp. 135-148.

APPENDIX 1

EQUIVALENCE OF CURRENT PROVINCIALLY CORRELATED BEC CODES AND THE PRE-CORRELATION CLASSIFICATION CODES FOR ECOSYSTEMS IN THE CARIBOO FOREST REGION

The following table provides the current provincially correlated BEC unit codes used in this guide and their equivalents in the previous ecosystem classification described in "A Field Guide for the Identification and Interpretation of Ecosystems of the Cariboo Forest Region" (last revised January 1989).

TABLE A1.1. Site units (shaded) in the Cariboo Forest Region and their precorrelation equivalents (unshaded).

Current (correlated) BEC unit code												
BEC Unit		Site unit										
		/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
Equivalent precorrelation code												
	BEC Unit	Ecosystem unit										
AT	AT	(site units not yet described)										
BGxh3	PPBGg	(see Iverson and Coupé 1996a)										
BGxw2	PPBGe	(see Iverson and Coupé 1996b)										
CWHds1	CWHc				see Guide for Vancouver Region (Green and Klinka 1994)							
ESSFdc2	ESSFe1				see Guide for Kamloops Forest Region (Lloyd et al. 1990)							
ESSFwc3	ESSFh2	/01	/02	/03								
ESSFwk1	ESSFh1	/01	/02	/03	/05	/04	/07 in part	/07 in part				
ESSFxc	ESSFd				see Guide for Kamloops Forest Region (Lloyd et al. 1990)							
ESSFxv1	ESSFg, ESSF undif	npe	npe	npe	npe	npe	npe	npe	npe			
ESSFxv2	ESSFg, ESSF undif	npe	npe	npe	npe	npe	npe	npe	npe			
ICHdk	ICHe3	/01	/02	/03	/04	/05	/06	/07	/08	/09		
ICHmk3	ICHe2	/01,/04	/02	/03	/05	/06	/07	/08				
ICHmw3	ICHm1				see Guide for Kamloops Forest Region (Lloyd et al. 1990)							
ICHwk2	ICHh1	/01,/05	/02	/03	/04	/06 in part	/06 in part	/07	/08			
ICHwk4	ICHh2	/01,/06	/02	/03	/04	/05	/07	/08	/09			
IDFdk3	IDFb2	/01	/03	/02	/05	/04	/06	/07	/08	/09, /10		
IDFdk4	IDFb5	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	
IDFdw	IDFundiff.	npe	npe	npe	npe	npe	npe	npe	npe			
IDFmw2	IDFj1				see Guide for Kamloops Forest Region (Lloyd et al. 1990)							
IDFxm	IDFa4	/01	/02	/03	/04	/05	/06	/07	/08	/09		
IDFxw	IDFa2	/01,/05,/07	/02	/03	/04	/06	/08	/09				

[a] No previous equivalent (npe)

TABLE A 1.1 (continued)

		Current (correlated) BEC unit code										
BEC unit		Site unit										
		/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
		Equivalent Precorrelation Code										
	BEC unit	Ecosystem Unit										
MHmm2	MHb	see Guide for Vancouver Forest Region (Green and Klinka 1994)										
MSdc2	MS undiff	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe
MSdv	MS undiff	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe
MSxk	MSc	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
MSxv	MSd	/01	/03	/02	/04	/05	/06	/07	/08			
SBPSdc	SBSa3	/01	/02	/03,/04	/05	/06	/07	/09	/08			
SBPSmc	SBSa2	see Guide for Prince Rupert Forest Region (Banner et al 1993)										
SBPSmk	SBSb	/01	/02	/03	/04	/05	/06	/07	/08,/09			
SBPSxc	SBSa1	/01	/02,/03	/05	/04	/06	/07					
SBSdw1	SBSk1	/01	/02	/03	/04	/05	/06	/07	/08	/09		
SBSdw2	SBSk2	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
SBSmc1	SBSm2	/01	/02	/03	/04	/06	/05	/07	/08			
SBSmc2	SBSc1	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
SBSmh	SBSl	/01	/02	/03	/04	/05	/06	/07	/08	/09		
SBSmm	SBSm	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
SBSmw	SBSc	/01	/02	/05	/03,/04	npe	/06	/07	/08	/09	/10	
SBSwk1	SBSj1	/01	/02	/03,/04	/05	/06	npe	/07	/08	/10	/09	/11

[a] No previous equivalent (npe)

References

Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 26.

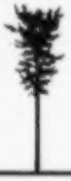
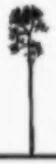
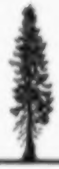
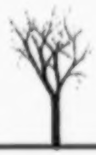
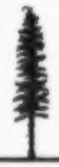
Green, R.N. and K. Klinka. 1994. A field guide to site identification and interpretation for the Vancouver Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 28.

Iverson, K. and R.A. Coupé. 1996a. Preliminary classification and description of grassland site series in the Bunchgrass Very Dry Hot Subzone, Fraser Variant (BGxh3). Unpublished report. Research Section, Cariboo Forest Region, B.C. Min. For. Williams Lake, B.C.

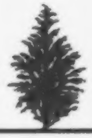
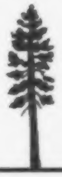
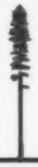
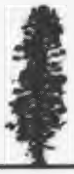
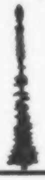
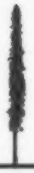
– . 1996b. Preliminary classification and description of grassland and forested site series in the Bunchgrass Very Dry Warm Subzone, Alkali Variant (BGxw2). Unpublished report. Research Section, Cariboo Forest Region, B.C. Min. For. Williams Lake, B.C.

Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 23.

APPENDIX 2
TREE SPECIES CODES AND SYMBOLS

Tree Code	Common name	Scientific name	Symbol
Act	black cottonwood	*Populus balsamifera* ssp. *trichocarpa*	
At	trembling aspen	*Populus tremuloides*	
Bl	subalpine fir	*Abies lasiocarpa*	
Cw	western redcedar	*Thuja plicata*	
Ep	paper birch	*Betula papyrifera*	
Fd	Douglas-fir	*Pseudotsuga menziesii*	
Hw	western hemlock	*Tsuga heterophylla*	

APPENDIX 2 (Continued)

Tree Code	Common name	Scientific name	Symbol
Jr	Rocky Mountain juniper	*Juniperus scopulorum*	
Pa	whitebark pine	*Pinus albicaulis*	
Pl	lodgepole pine	*Pinus contorta*	
Py	ponderosa pine	*Pinus ponderosa*	
Sb	black spruce	*Picea mariana*	
Se	Engelmann spruce	*Picea engelmannii*	
Sw **(Sxw)**	white spruce (hybrid white spruce)	*Picea glauca* (*Picea engelmannii* x *glauca*)	

APPENDIX 3
ECOREGION CLASSIFICATION OF THE CARIBOO FOREST REGION

Seven ecoregions and 15 ecosections occur partly or entirely within the Cariboo Forest Region (Figure A3.1; Table A3.1). They are distinguished by physiographic features (mountain ranges, highlands, plateaus, or basins) and by large-scale climatic processes and weather patterns (Demarchi 1996). Differences in physiography and climatic processes result in differences in vegetation and wildlife potentials. In contrast to biogeoclimatic subzones, ecosections are characterized by climatic processes and weather patterns rather than by climate. Ecosections often encompass a wide range in elevation.

Pacific Ranges Ecoregion

The Pacific Ranges Ecoregion includes the high, rugged Coast Mountains along the central and southern coast of British Columbia. In the Cariboo Forest Region, it is represented by one ecosection, which covers only a very small portion of the Region.

Northern Pacific Ranges (NPR) Ecosection includes the lower Mosley Creek valley and the high, rugged mountains of the Mt. Waddington area in the southwestern corner of the Region. This area has a wet, relatively mild climate dominated by the effects of coastal air masses rising over the high mountains. It is a highly glaciated alpine area with wet mountain forests of hemlock, amabilis fir, Douglas-fir, and redcedar. This ecosection occurs primarily in the Vancouver Forest Region.

Chilcotin Ranges Ecoregion

The Chilcotin Ranges Ecoregion is a mountainous area in the rainshadow of the Pacific Ranges with a cold, relatively dry climate. Precipitation is greatest in the northwest portion and least in the southeast portion. This ecoregion includes two ecosections, both of which occur in the Cariboo Forest Region.

Central Chilcotin Ranges (CCR) Ecosection is a dry, rounded mountain area with dry alpine tundra and dry conifer forests. It lies in the strong rainshadow of the high Pacific Ranges, east of approximately Mosley (West Branch) Creek.

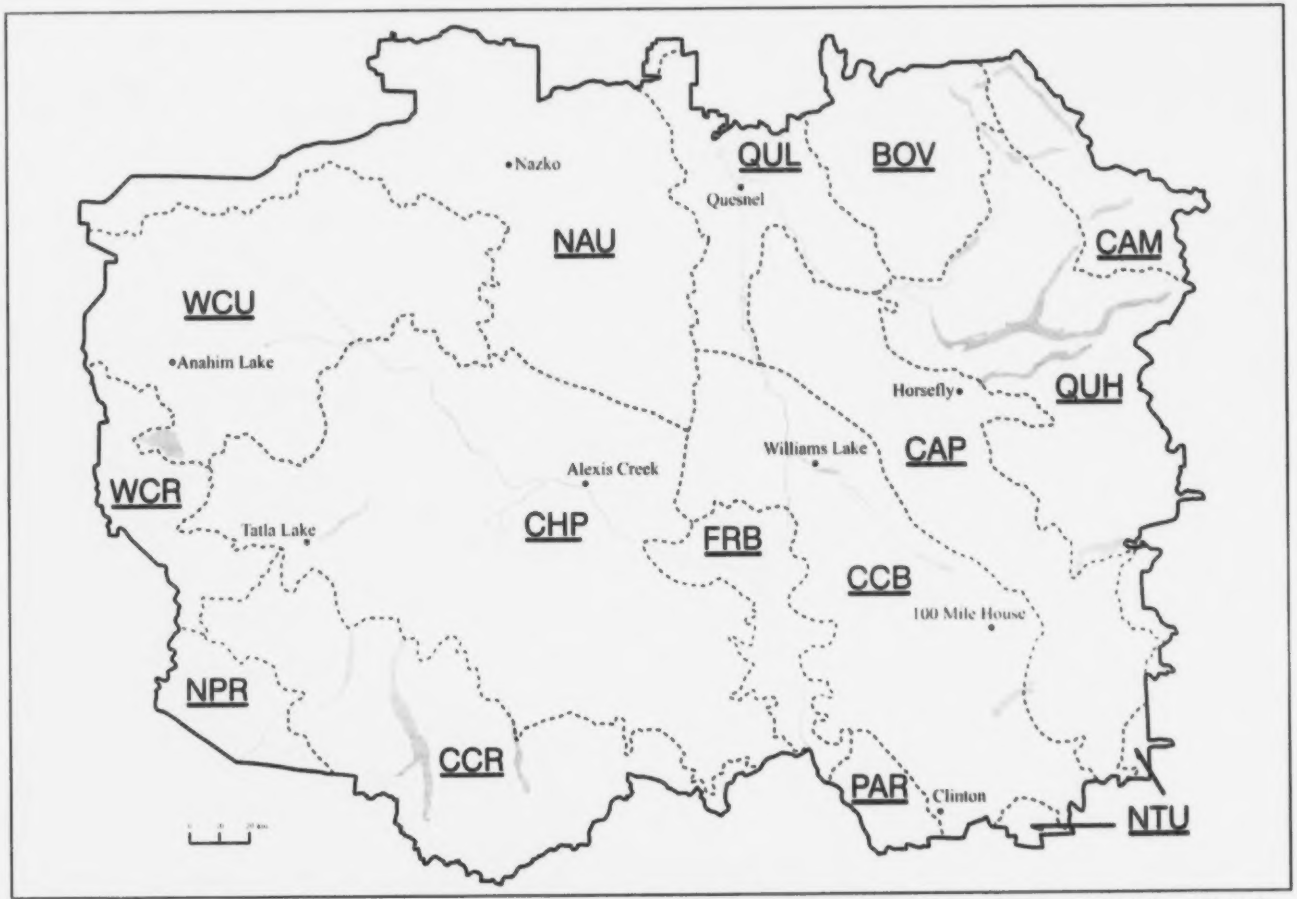

Nazko
QUL
Quesnel
BOV
CAM
NAU
WCU
Anahim Lake
QUH
Horsefly
CAP
Williams Lake
Alexis Creek
WCR
Tatla Lake
CHP
FRB
CCB
100 Mile House
NPR
CCR
PAR
Clinton
NTU

FIGURE A3.1 Map showing the ecosections of the Cariboo Forest Region. Refer to Table A3.1 for explanation of ecosection codes.

TABLE A3.1 Ecoregion classification for the Cariboo Forest Region

Ecodomain	Ecodivision	Ecoprovince	Ecoregion	Ecosection	Code
Humid Temperate	Humid Maritime and Highlands	Coast and Mountains	Pacific Ranges	Northern Pacific Ranges	NPR
	Humid Continental Highlands	Central Interior	Chilcotin Ranges	Central Chilcotin Ranges	CCR
				Western Chilcotin Ranges	WCR
			Fraser Plateau	Cariboo Basin	CAB
				Cariboo Plateau	CAP
				Chilcotin Plateau	CHP
				Fraser River Basin	FRB
				Nazko Upland	NAU
				Quesnel Lowland	QUL
				Western Chilcotin Upland	WCU
		Southern Interior Mountains	Columbia Highlands	Bowron Valley	BOV
				Quesnel Highland	QUH
			Northern Columbia Mountains	Cariboo Mountains	CAM
Dry	Semi-arid Steppe Highlands	Southern Interior	Interior Transition Ranges	Pavilion Ranges	PAR
			Thompson-Okanagan Plateau	Northern Thompson Upland	NTU

The **Western Chilcotin Ranges (WCR) Ecosection** is a somewhat more rugged area that is slightly wetter due to apparently greater maritime influence. It lies roughly northwest of Mosley Creek to the Hotnarko River.

Fraser Plateau Ecoregion

The Fraser Plateau Ecoregion lies east of the Chilcotin Ranges and includes the largest portion of the Cariboo Forest Region, extending east to the Quesnel Highland. It is a plateau landscape with a level to gently rolling topography. Six ecosections of this Ecoregion occur within the Cariboo Forest Region. All are located in the rainshadow of the Pacific Ranges but they receive different amounts of precipitation depending on the distance from the Pacific Ranges and intensity of the rainshadow. In general, precipitation increases from west to east and from low to high elevations. The frequency of Arctic air incursions in winter and early spring generally increases from south to north.

Chilcotin Plateau (CHP) Ecosection occurs just east of the Chilcotin Ranges Ecosection in the driest parts of the Ecoregion. It is a level to gently rolling plateau with extensive lodgepole pine forests.

West Chilcotin Upland (WCU) Ecosection also lies in the rainshadow but it is a higher-elevation rolling upland northwest of the Chilcotin Plateau. It includes high shield volcanoes with alpine areas and dry lodgepole pine forests. It has a very cold and dry climate.

Cariboo Basin (CAB) Ecosection occurs east of the Chilcotin Plateau Ecosection in an area where the rainshadow effect is lessened and precipitation is somewhat increased. It is south of the area of most frequent Arctic air incursions and is relatively warm and dry. Douglas-fir forests dominate the landscape.

Fraser River Basin (FRB) Ecosection lies between the Chilcotin Plateau and Cariboo Basin ecosections, in the valleys of the Fraser and Chilcotin rivers. The climate is dominated by the rainshadow of the Pacific Ranges and by the effects of heating associated with deep, low-elevation valleys. The climate is hot and dry. The vegetation is predominantly grasslands and dry Douglas-fir forests.

Cariboo Plateau (CAP) Ecosection is a level to gently rolling plateau lying east of the Cariboo Basin Ecosection. Precipitation is greater than on the Chilcotin Plateau since air masses are moistened with water picked up while crossing extensive areas of plateau to the west. The vegetation is more productive here than in the Chilcotin Plateau Ecosection, and is dominated by Douglas-fir, lodgepole pine, and spruce forests.

Nazko Upland (NAU) Ecosection occurs in the northern portions of the Fraser Plateau where Arctic air incursions are relatively frequent in winter and early spring. It is a rolling to hilly landscape with a more boreal-like climate (wetter, snowier) than the other ecosections of the Fraser Plateau in the Cariboo Forest Region. It has a cold, moist climate. Forests are dominated by lodgepole pine, spruce, and some subalpine fir. Black spruce is common in wet, lowland depressions.

Quesnel Lowland (QUL) Ecosection lies between the Nechako Upland and Bowron Valley ecosections and occupies the Fraser and Quesnel river valleys near Quesnel. Incursions of Arctic air are more frequent during winter and early spring and snowfall is greater than in valleys of the Fraser River Basin Ecosection to the south. Sub-boreal forests of spruce, Douglas-fir, and deciduous species dominate the landscape. Black spruce becomes more common from south to north in this ecosection.

Columbia Highlands Ecoregion

The Columbia Highlands Ecoregion occurs in the eastern part of the Cariboo Forest Region. Precipitation is higher here than on the plateau to the west due to the rise of air masses, which have picked up moisture from the Fraser Plateau, over the highlands and towards the Cariboo Mountains. These are the wettest portions of the Cariboo Forest Region, east of the Pacific Ranges. Within the Cariboo Forest Region, this ecoregion is represented by two ecosections.

Quesnel Highland (QUH) Ecosection is a highland area with precipitation intermediate between that of the plateau to the west and the high mountains to the east. The area is less affected by incursions of Arctic air than are areas further north. The climate is relatively warm and wet at mid and low elevations. High elevations have a cold, moderately wet and snowy climate. The vegetation is dominated by forests of western redcedar and western hemlock at low elevations and by subalpine fir and Engelmann spruce at higher elevations.

Bowron Valley (BOV) Ecosection occurs north of the Quesnel Highland Ecosection and is more frequently affected by Arctic air in winter and early spring. It has a colder, snowier climate. Forests of spruce, subalpine fir, and lodgepole pine dominate the landscape.

Northern Columbia Mountains Ecoregion

The Northern Columbia Mountains Ecoregion occurs in the easternmost portion of the Cariboo Forest Region, in Bowron Park, and east of Quesnel Lake. Within the Region, it is represented by one ecosection.

Cariboo Mountains (CAM) Ecosection includes the high, rugged Cariboo Mountains that lie east of the Quesnel Highland and Bowron Valley ecosections. It is a wet, cold, snowy area with numerous avalanche tracks. Vegetation of this area is dominated by forests similar to those of the Quesnel Highland and Bowron Valley ecosections with redcedar/hemlock forests at low to mid elevations and subalpine fir / Engelmann spruce forests at higher elevations. Alpine tundra, glaciers, and barren rock are common at highest elevations.

Interior Transition Ranges Ecoregion

The Interior Transition Ranges Ecoregion is an area of moderate relief south of the Fraser Plateau in the rainshadow of the Pacific Ranges. Within the Cariboo Forest Region, it is represented by one ecosection.

Pavilion Ranges (PAR) Ecosection includes the Clear and Pavilion ranges between Clinton and the Fraser River. This is a mountainous upland area that is transitional to the Coast Mountains to the west and the plateau landscapes to the east. Compared to more northern ecosections, this area is less frequently affected by incursions of cold Arctic air and more often affected by hot dry air from the Great Basin to the south. Calcareous soils are common. Lower elevations are vegetated by Douglas-fir and ponderosa pine forests, while mid and high elevations are dominated by lodgepole pine and some subalpine fir and spruce forests.

Thompson–Okanagan Plateau Ecoregion

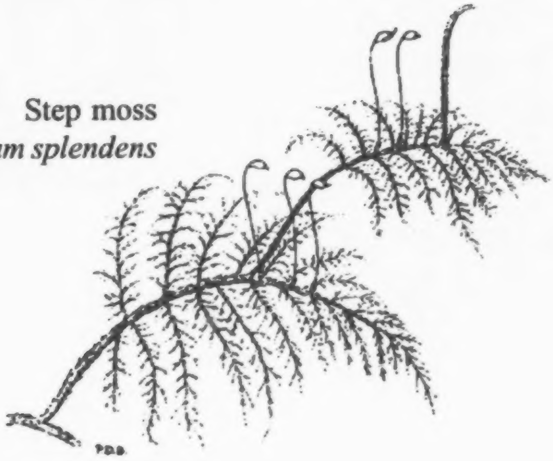
The Thompson–Okanagan Plateau Ecoregion is an area of relatively dry rolling hills, extending from the southeastern corner of the Cariboo Forest Region to south of Okanagan Lake. It occurs primarily in the Kamloops Forest Region and is represented in the Cariboo Forest Region by one ecosection, covering only a very small portion of the Region.

North Thompson Upland (NTU) Ecosection includes the area around Hihium and Bonaparte lakes and the area south of Lac de Roche. It is located in the rainshadow of the Pacific Ranges and generally has a warm climate with fewer incursions of cold Arctic air in winter and early spring than occurs on the Fraser Plateau to the north. This area is dominated by forests of Douglas-fir, lodgepole pine, and some spruce.

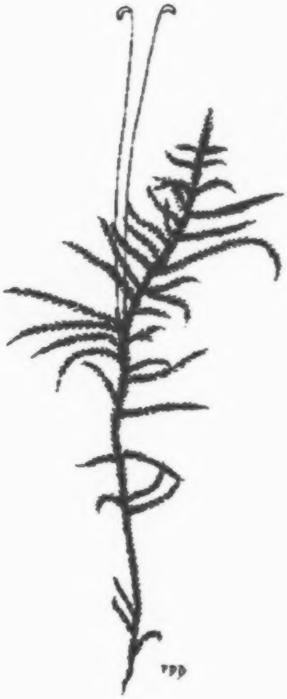
The full ecoregion classification for the Cariboo Forest Region is listed on Table A3.1. Units of the classification are defined by Demarchi (1996).

Reference

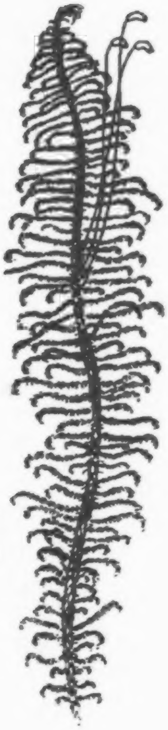
Demarchi, D.A. 1996. An introduction to the ecoregions of British Columbia. Unpublished draft report. Wildlife Br., Min. Environment, Lands and Parks, Victoria, B.C.



Step moss
Hylocomium splendens



Red-stemmed feathermoss
Pleurozium schreberi



Knight's plume
Ptilium crista-castrensis

APPENDIX 4
RELATIVE SOIL MOISTURE REGIME IDENTIFICATION KEY

This key is an aid for identifying relative soil moisture regime using readily observable site features. It should be applied with caution, as all possible combinations of site factors potentially encountered have not been incorporated into the key. As well, the season in which observations are being made may affect the user's interpretation of site factors. For example, a water table or seepage water may exist for a brief period immediately following snow melt in the spring in an otherwise moderately well-drained site. Also, soils with two or more contrasting soil textures will require an interpretation of their combined effect on the soil's ability to hold moisture.

When more than one moisture regime is indicated in the key, the user should evaluate the combined attributes of the site relative to the range of variability of each attribute specified in the key. A moisture regime should then be selected based on the relative position of the site attributes along the range of variability specified in the key. For example, if the soil texture is at the fine end of the range given, the slope gradient is at the gentler end of the range given, and the soil depth is at the deeper end of the range given, then the wetter of the two moisture regimes given should be selected.

Definition of Terms Used in Soil Moisture Regime Key

Ridge crest is uppermost portion of hill or other raised land area; usually with convex slope shape.

Upper slope is upper portion of slope below the crest; usually with convex slope shape.

Middle slope is portion of the slope between the upper and lower slope position; slope shape is usually neither distinctly concave nor convex, but straight.

Lower slope is slope portion near the base of the slope where slope gradient is generally decreasing; slope shape is generally concave.

Toe slope is area at base of slope demarcated from adjacent lower slope position by an abrupt decrease in slope gradient; generally level areas (<5% gradient) at base of slope, where moisture status is influenced by adjacent slope.

SE to W is any slope aspect from 135 to 280°. inclusive.

Level (flats) is any level area sufficiently removed from a slope that moisture status is not affected by runoff from a slope; the surface may be undulating with very low relief raised areas and very short slopes; surface shape is generally straight and has no clearly defined aspect.

Depression is an area that slopes upward in all directions; slope shape is concave; depressions usually occur at base of a slope or in level topography.

Soil depth is depth from mineral soil surface to a strong root-restricting layer such as bedrock or strongly compacted or cemented materials (e.g., hardpan).

Climate dry is climate of any of the following biogeoclimatic subzones: BGxh, BGxw, IDFxw, IDFxm, SBPSxc.

Gleyed soils are soils influenced by periodic or sustained water saturation as indicated by gleyed colors (dull yellowish, blue, or olive) or prominent mottles (reddish or orange spots, or blotches at least 1 mm in cross-section and occupying at least 2% of the exposed, unsmeared soil face) occurring throughout a layer at least 10 cm thick and within 50 cm of the mineral surface; strongly gleyed soils have a dominant colour of dull blue, olive, or yellowish resulting from sustained water saturation and reducing conditions.

Free water is water in excess of that which can be held against gravity by the soil particles; soil moisture in excess of field capacity.

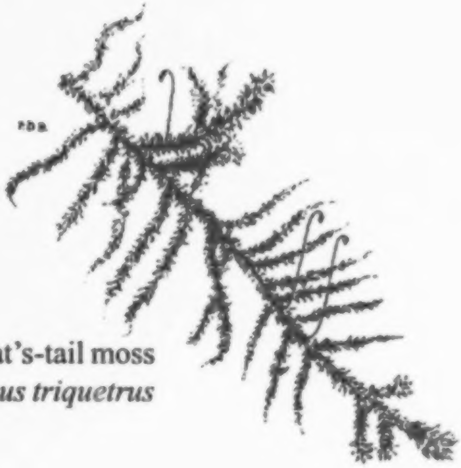
Water table is the surface of a zone of prolonged water saturation and free water; primarily on level or gently sloping sites.

Soil particle size refers to the particle size composition of the soil including the proportion of sand (0.05–2.0 mm), silt (0.002–0.05 mm), and clay (<0.002 mm) sized particles as well as the proportion of coarse fragments (>2.0 mm). **Very coarse, Coarse, Medium, Fine,** and **Very fine** particle size classes are defined in Appendix 10.

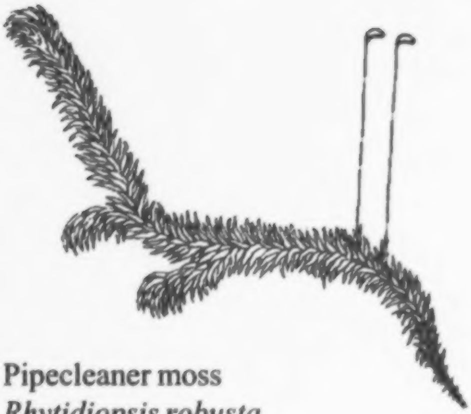
Seepage refers to saturated soils resulting from downslope subsurface movement of free water, generally above an impeding layer; to be considered seepage, the volume of soil water movement and the resulting duration of soil saturation should be sufficient to affect vegetation or soil colour.

Moisture regime code refers to relative soil moisture regime:

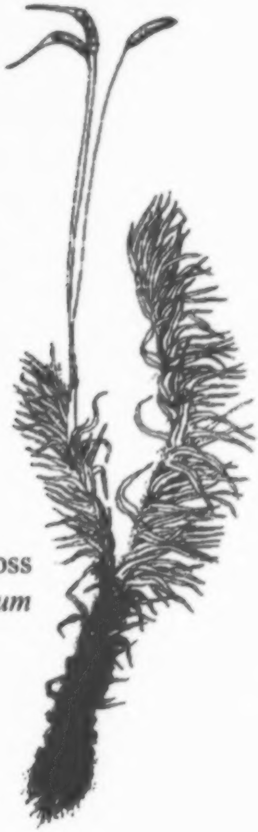
0 = very xeric
1 = xeric
2 = subxeric
3 = submesic
4 = mesic
5 = subhygric
6 = hygric
7 = subhydric
8 = hydric



Electrified cat's-tail moss
Rhytidiadelphus triquetrus

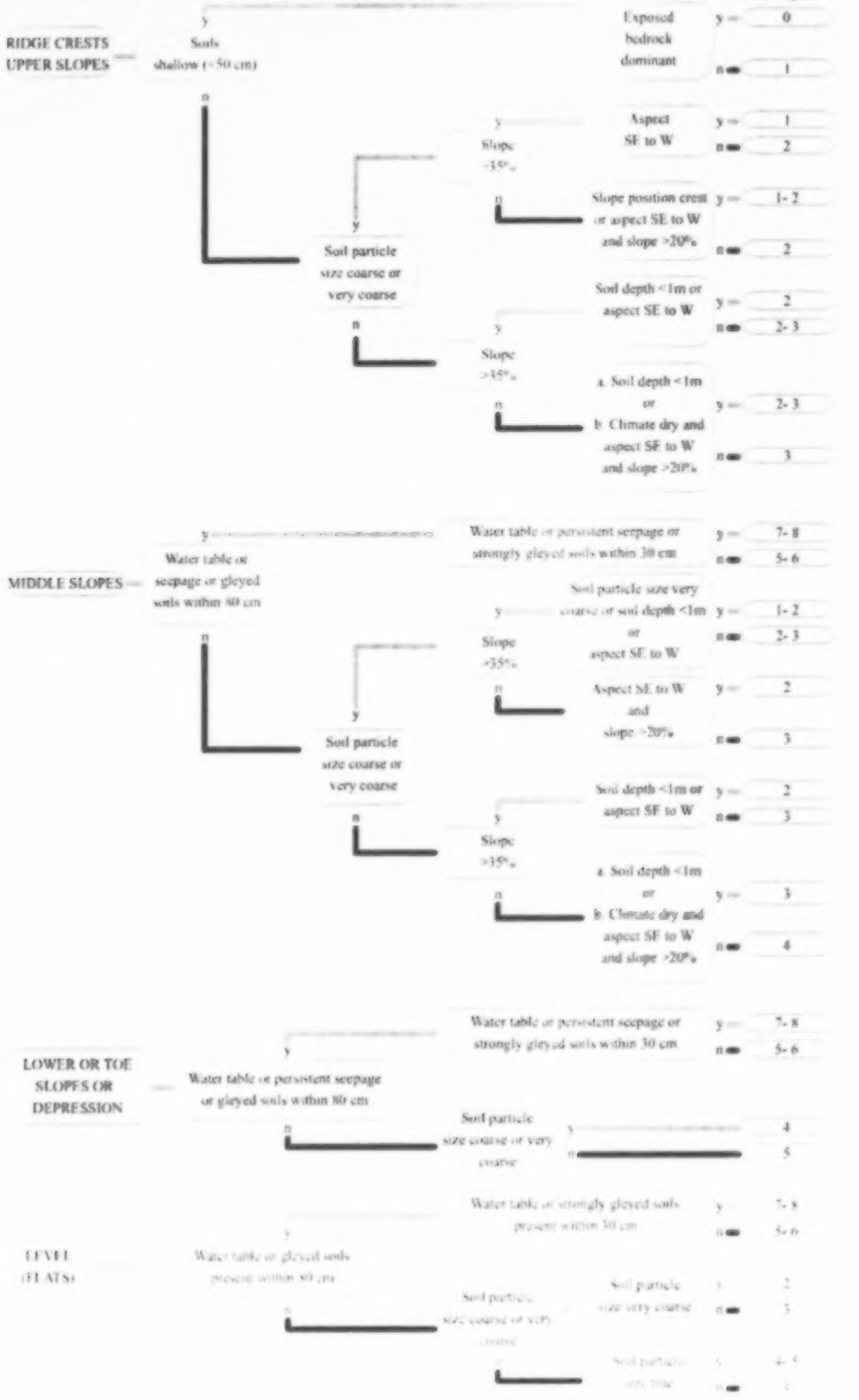


Pipecleaner moss
Rhytidiopsis robusta



Wavy-leaved moss
Dicranum polysetum

RELATIVE SOIL MOISTURE REGIME IDENTIFICATION KEY

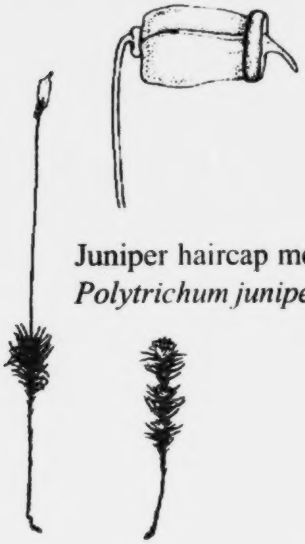

Moisture Regime Code
RIDGE CRESTS UPPER SLOPES
Soils shallow (<50 cm)
y
Exposed bedrock dominant
y 0
n 1
n
Slope >35%
y
Aspect SE to W
y 1
n 2
n
Slope position crest or aspect SE to W and slope >20%
y 1-2
n 2
y
Soil particle size coarse or very coarse
n
Slope >35%
y
Soil depth <1m or aspect SE to W
y 2
n 2-3
n
a. Soil depth <1m or b. Climate dry and aspect SE to W and slope >20%
y 2-3
n 3
MIDDLE SLOPES
Water table or seepage or gleyed soils within 80 cm
y
Water table or persistent seepage or strongly gleyed soils within 30 cm
y 7-8
n 5-6
n
Slope >35%
y
Soil particle size very coarse or soil depth <1m or aspect SE to W
y 1-2
n 2-3
n
Aspect SE to W and slope >20%
y 2
n 3
y
Soil particle size coarse or very coarse
n
Slope >35%
y
Soil depth <1m or aspect SE to W
y 2
n 3
n
a. Soil depth <1m or b. Climate dry and aspect SE to W and slope >20%
y 3
n 4
LOWER OR TOE SLOPES OR DEPRESSION
Water table or persistent seepage or gleyed soils within 80 cm
y
Water table or persistent seepage or strongly gleyed soils within 30 cm
y 7-8
n 5-6
n
Soil particle size coarse or very coarse
y 4
n 5
LEVEL (FLATS)
Water table or gleyed soils present within 80 cm
y
Water table or strongly gleyed soils present within 30 cm
y 7-8
n 5-6
n
Soil particle size coarse or very coarse
y
Soil particle size very coarse
y 2
n 3
n
Soil particle very fine
y 4-5
n 3

APPENDIX 5
ACTUAL SOIL MOISTURE REGIME RELATIONSHIP TO RELATIVE SOIL MOISTURE REGIME AND BIOGEOCLIMATIC UNIT

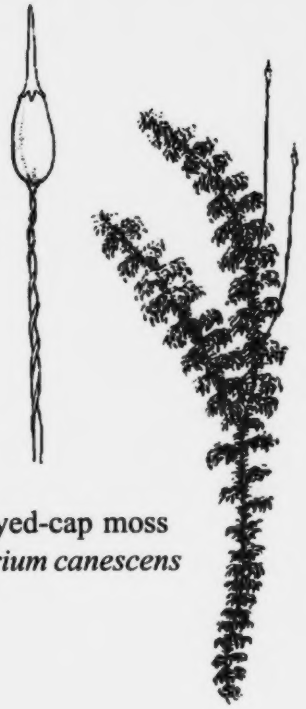
BEC	Relative soil moisture regime							
unit	0	1	2	3	4	5	6	7
BGxh3	ED	ED	ED	ED	ED	SD	M	W
BGxw2	ED	ED	ED	ED	ED	SD	M	W
IDFxw	ED	ED	VD	VD	MD	SD	M	W
IDFxm	ED	ED	VD	VD	MD	SD	M	W
SBPSxc	ED	ED	VD	VD	MD	SD	M	W
SBPSdc	ED	ED	VD	MD	SD	F	M-VM	W
SBPSmk	ED	VD	VD	MD	SD	F	M-VM	W
IDFdk3	ED	VD	VD	VD	MD	F	M	W
IDFdk4	ED	VD	VD	VD	MD	F	M	W
IDFdw	ED	VD	VD	MD	MD	F	VM	W
IDFmw2	VD	VD	VD	MD	SD	F	VM	W
MSxk	VD	VD	VD	VD	MD	F	M	W
MSxv	VD	VD	VD	MD	SD	F	VM	W
SBPSmc	VD	VD	VD	MD	SD	F	M-VM	W
SBSdw1	VD	MD	MD	SD	SD	F	M	W
SBSdw2	VD	MD	MD	SD	SD	F	M	W
SBSmh	VD	MD	MD	SD	SD	M	VM	W
SBSmw	VD	MD	MD	SD	F	M	VM	W
SBSmc1	VD	MD	MD	SD	F	M	VM	W
SBSmc2	VD	MD	MD	SD	F	M	VM	W
SBSwk1	VD	MD	SD	F	F	M	VM	W
ICHdk	VD	VD	VD	MD	SD	M	VM	W
ICHmk3	VD	MD	MD	SD	F	M	VM	W
ICHwk2	VD	MD	SD	F	F	M	VM	W
ICHwk4	VD	MD	SD	F	F	M	VM	W
ESSFxv	VD	VD	MD	MD	SD	F	M	W
ESSFdc2	VD	MD	MD	SD	SD-F	M	VM	W
ESSFwk1	MD	MD	SD	F	M	M	VM	W
ESSFwc3	MD	MD	SD	F	M	M	VM	W

Actual Moisture Regime Codes:

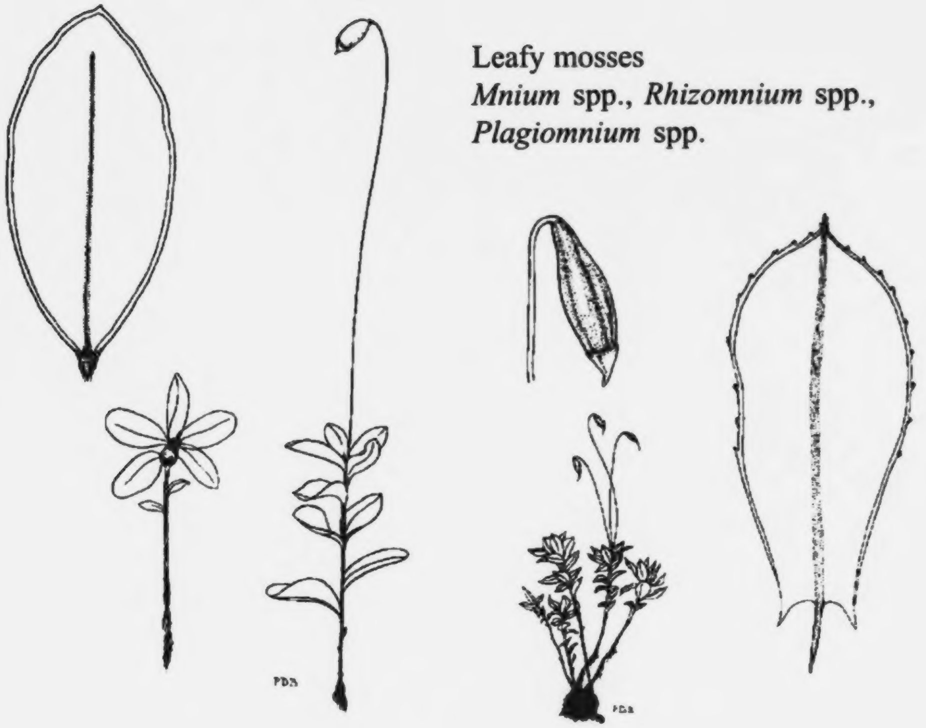
ED=extremely dry; VD=very dry; MD=moderately dry; SD=slightly dry; F=fresh; M=moist; VM=very moist; W=wet



Juniper haircap moss
Polytrichum juniperinum



Grey frayed-cap moss
Racomitrium canescens



Leafy mosses
Mnium spp., *Rhizomnium* spp.,
Plagiomnium spp.

APPENDIX 6
SOIL NUTRIENT REGIME IDENTIFICATION

Soil nutrient regime indicates, on a relative scale, the available nutrient supply for plant growth (Pojar *et al.* 1987). Emphasis is on soil nitrogen levels, soil pH, and the exchangeable cations calcium, magnesium, sodium, and potasium in the rooting zone of plants. The soil nutrient regime integrates many environmental and biotic parameters that, in combination, determine the relative amounts of available nutrients. The aim of the assessment is to derive an estimate of the available nutrient supply for a site, which will characterize it relative to all other sites occurring within the biogeoclimatic subzone or variant. The field assessment is a qualitative evaluation of site characteristics. A quantitative assessment is not usually appropriate since the precise nutrient requirements for most plant species are not well known and laboratory analyses are costly and time consuming.

Common site factors and their relative contribution to soil nutrient regime are shown in Table A6.1. All factors should be evaluated simultaneously to determine the site nutrient class. Use of the table involves considering the relative levels of all factors. For example, a site with a deep, coarse soil, granite (low base) soil parent material, mor humus form, low soil organic matter content, and no seepage would be classified as poor. In contrast, a site with a deep, fine-textured soil, basalt (medium base) soil parent material, moder humus form, medium soil organic matter content, and temporary seepage would be classified as rich. As many factors as possible should be evaluated because a limiting factor may be compensated for by the effect of other factors. For example, a site with very coarse soil could be classified as rich if persistent seepage were present in the soil rooting zone.

Definitions of terms used in Table A6.1

Humus forms

See Appendix 12.

Soil depth

Extremely shallow is generally less than 30 cm over a root-restricting layer such as bedrock or a permanent water table.

Very shallow to deep is generally greater than 30 cm over a root-restricting layer such as bedrock or a permanent water table.

Soil texture

Coarse textured is very coarse and coarse particle size classes as defined in Appendix 10.

Medium to fine textured is medium and fine particle size classes as defined in Appendix 10.

% coarse fragments

High means particles larger than 2.0 mm in diameter make up more than 70% of soil volume.

Moderate to low means particles larger than 2.0 mm in diameter make up less than 70% of soil volume.

Parent material minerology

Base - low means parent materials are derived from quartzite, gneiss, granite, granodiorite, quartzite, or conglomerate rock (see Appendix 8 for guide to rock type identification).

Base - medium means parent materials are derived from basalt, andesite, slate, phyllite, shale, mudstone, argillite, siltstone, schist, gabbro, or diorite rock.

Base - high means parent materials are derived from limestone, serpentine, or marble rock.

TABLE A6.1 Estimation of soil nutrient status [a]

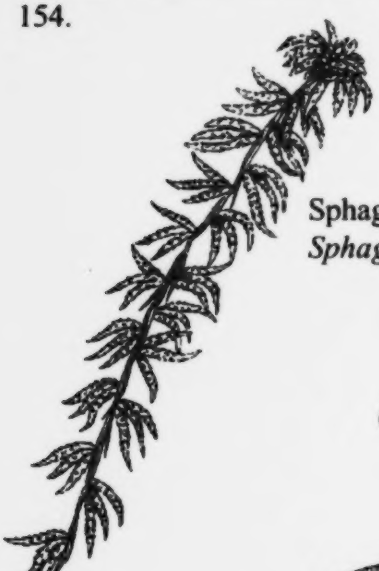
	A very poor	B poor	C medium	D rich	E very rich	F saline
Available nutrients	very low	low	average	plentiful	abundant	excess salt accum.
Humus form	Mor					
			Moder			
					Mull	
A horizon	Ae horizon present					
			A horizon absent			
				Ah horizon present		
Organic matter content	low (light coloured)					
		medium (inter in colour)				
			high (dark coloured)			
C:N ratio	high					
			moderate			
				low		
Soil depth	extremely shallow					
		very shallow to deep				
Soil texture	coarse textured					
		medium to fine textured				
% coarse fragments	high					
		moderate to low				
Parent material mineralogy	base-low					
		base-medium				
				base-high		
Soil pH	extremely- mod. acid					
		moderately acid- neutral				
				slightly acid - mildly alk.		
Water pH (wetlands)	< 4 - 5	4.5 - 5.5	5.5 - 6.5	6.5 - 7.4	7.4 +	
Seepage			temporary ——→ permanent			

[a] adapted from Province of British Columbia (1997). Field manual for describing terrestrial ecosystems. B.C. Ministry of Forests Land Management Handbook. Victoria, B.C. In press.

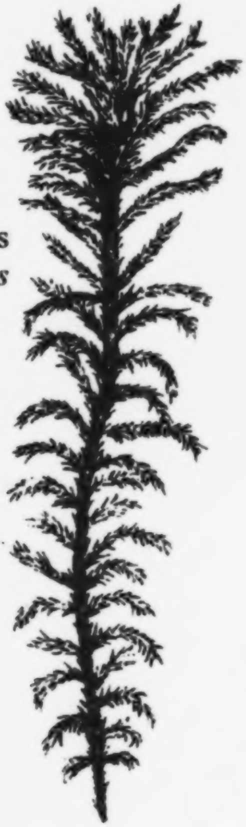
References

Braumandl, T. and M.P. Curran. 1992. A field guide for site identification and interpretation in the Nelson Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 20.

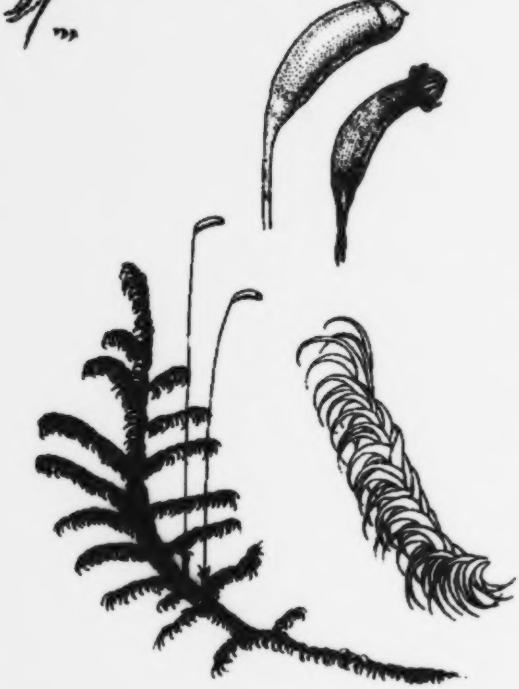
Pojar, J., K. Klinka, and D.V. Meidinger. 1987. Biogeoclimatic ecosystem classification British Columbia. For. Ecol. and Manage. 22:119-154.



Sphagnum mosses
Sphagnum spp.



Golden fuzzy fen moss
Tomenthypnum nitens



Sickle moss
Sanionia uncinatus

APPENDIX 7
GUIDE TO IDENTIFICATION OF SURFICIAL GEOLOGICAL MATERIALS[a]

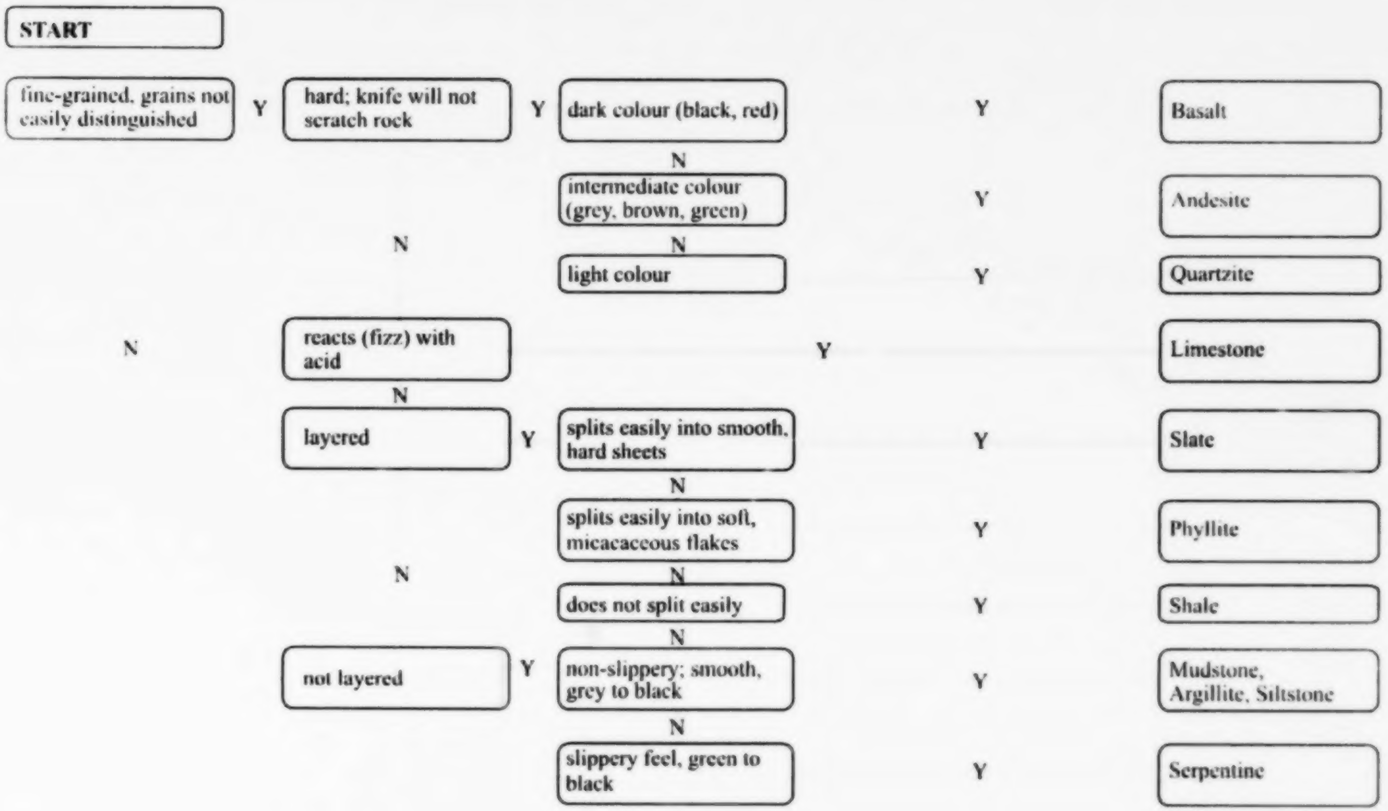
Surficial material class	Mode of deposition	Coarse fragment shape	Material sorting and layering	Texture	Landscape position
Colluvial	Materials that have reached their present position directly as a result of gravity-induced movement	angular / variable	generally non-sorted	variable (clay to boulders); loose; coarse fragments usually touch one another	usually on or at base of steep slopes
Morainal	Materials deposited directly by glacier ice without modification by any other agent of transportation	variable angularity; usually including some subangular	heterogeneous mix of particle sizes	variable (clay to boulders possible); often can feel some clay in subsoil; loose or compacted	variable
Fluvial	Materials deposited by streams and rivers since deglaciation	dominantly rounded	generally sorted and layered	gravels, sands and/or silts	generally level deposits at or slightly above stream levels
Glaciofluvial	Materials deposited by glacial meltwaters, either in front of or in contact with glacier ice	dominantly rounded	generally sorted and layered, layering may be irregular	mostly gravels and sand, frequently with large boulders occasionally includes silty and clayey materials	terraces, fans, outwash plains, eskers, kames

GUIDE TO IDENTIFICATION OF SURFICIAL GEOLOGICAL MATERIALS[a] (CONTINUED)

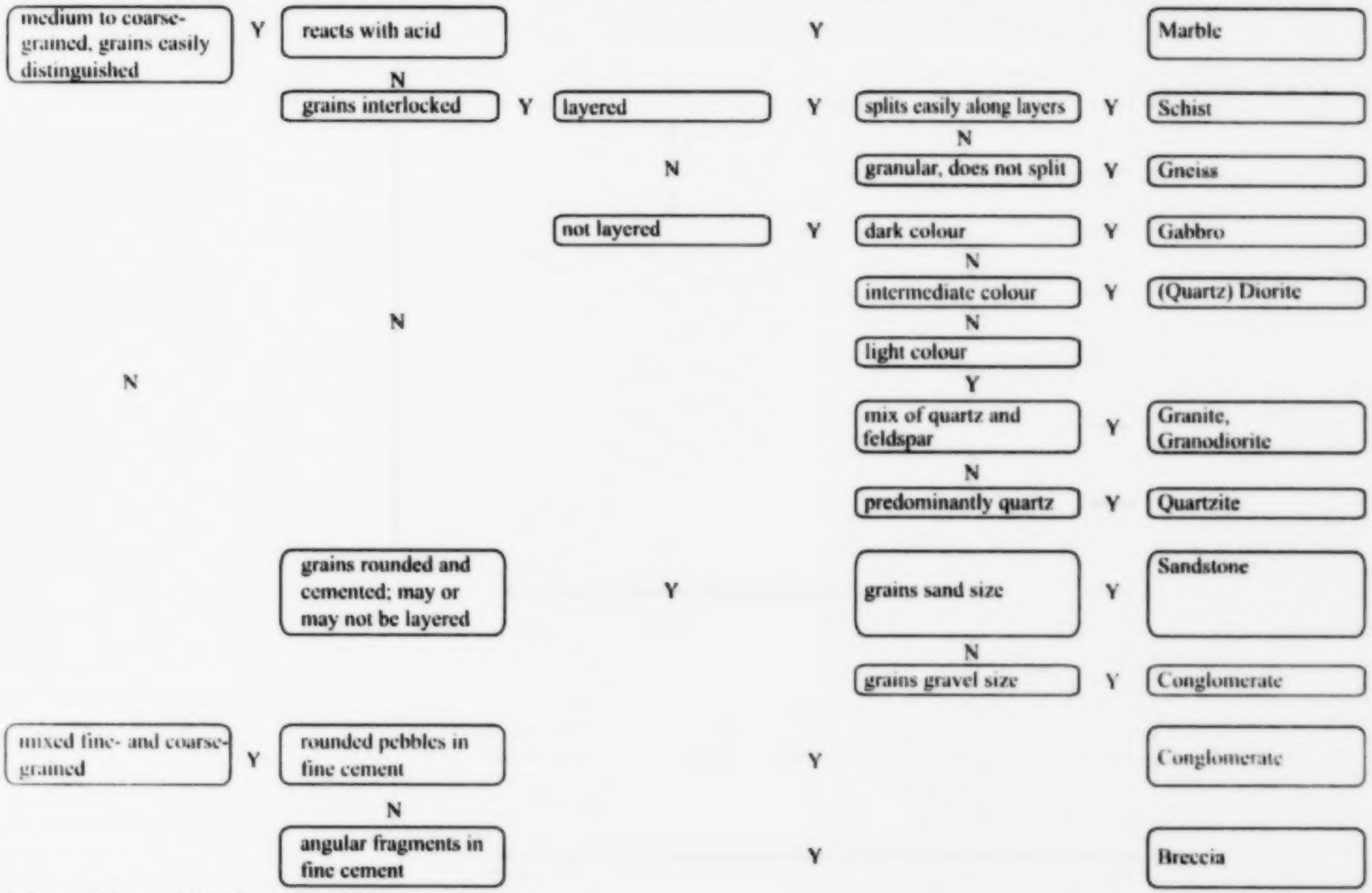
Surficial material class	Mode of deposition	Coarse fragment shape	Material sorting and layering	Texture	Landscape position
Lacustrine and Glacio - lacustrine	Materials that have settled out of suspension in bodies of standing water	n/a	sorted and layered; often more compacted at depth	silt, clay, and occasionally fine sand; may include occasional ice-rafted gravels and stones	lakebed deposits, often terraced
Eolian	Materials transported and deposited by wind	n/a	loose, well sorted	medium and fine sand, coarse silt; may contain some buried coarse fragments	dunes, moderately thick to thin capping overlying other landforms
Weathered bedrock	Bedrock decomposed *in situ* by mechanical and/or chemical weathering	variable; most commonly angular	loose, non-sorted	variable; may include sand, silt, and/or clay depending on the bedrock type	often ridge crests and upper slopes
Organic	Organic material accumulations > 40cm thick derived largely from decomposing vegetative matter on water-saturated sites	n/a	n/a	fibric, mesic, and humic "organic textures"	bogs, fens, swamps

[a] adapted from Howes, D.E. and E. Kenk. 1988. Terrain classification system for British Columbia. Revised. B.C. Min. Environ. and Min. Crown Lands, Victoria, B.C. Min. Environ. Manual 10.

APPENDIX 8
GUIDE TO THE COMMON ROCK TYPES OF THE CARIBOO FOREST REGION


START
fine-grained, grains not easily distinguished
Y
hard; knife will not scratch rock
Y
dark colour (black, red)
Y
Basalt
N
intermediate colour (grey, brown, green)
Y
Andesite
N
light colour
Y
Quartzite
N
N
reacts (fizz) with acid
Y
Limestone
N
layered
Y
splits easily into smooth, hard sheets
Y
Slate
N
splits easily into soft, micacaceous flakes
Y
Phyllite
N
N
does not split easily
Y
Shale
N
not layered
Y
non-slippery; smooth, grey to black
Y
Mudstone, Argillite, Siltstone
N
slippery feel, green to black
Y
Serpentine

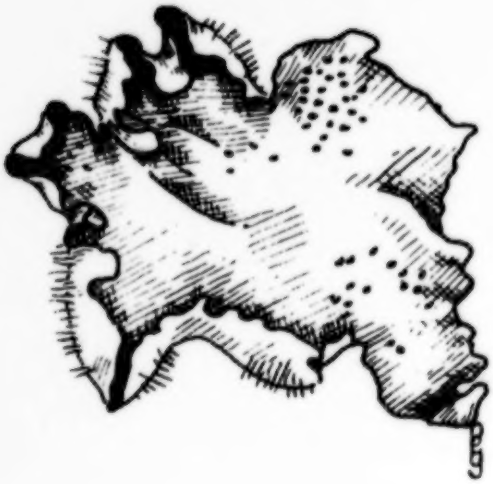
GUIDE TO THE COMMON ROCK TYPES OF THE CARIBOO FOREST REGION (Continued)


medium to coarse-grained, grains easily distinguished
Y
reacts with acid
Y
Marble
N
grains interlocked
Y
layered
Y
splits easily along layers
Y
Schist
N
N
granular, does not split
Y
Gneiss
not layered
Y
dark colour
Y
Gabbro
N
intermediate colour
Y
(Quartz) Diorite
N
N
light colour
N
Y
mix of quartz and feldspar
Y
Granite, Granodiorite
N
predominantly quartz
Y
Quartzite
grains rounded and cemented; may or may not be layered
Y
grains sand size
Y
Sandstone
N
grains gravel size
Y
Conglomerate
mixed fine- and coarse-grained
Y
rounded pebbles in fine cement
Y
Conglomerate
N
angular fragments in fine cement
Y
Breccia

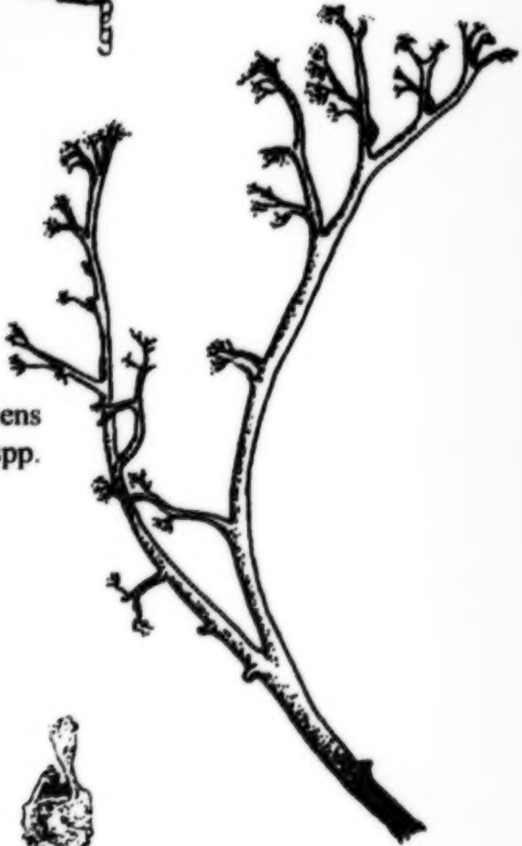
Adapted from Lloyd *et al.* (1990)

Reference

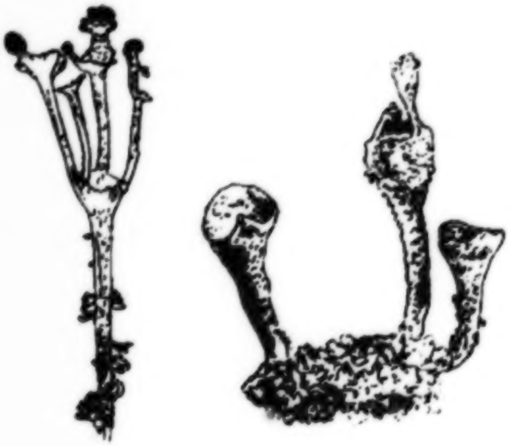
Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 23.



Freckle pelt lichen
Peltigera aphthosa



Cladina lichens
Cladina spp.



Cladonia lichens
Cladonia spp.

APPENDIX 9
GUIDE TO FIELD SOIL TEXTURING

Soil texture refers to the relative proportion of **sand**, **silt**, and **clay**, which together make up the fine fraction (<2 mm) of the soil. Sand particles are 0.05–2.0 mm in diameter, silt particles are 0.002–0.05 mm in diameter, and clay particles are less than 0.002 mm in diameter. Each of these size classes has their own distinctive properties such as graininess, slipperiness or soapiness, grittiness, and stickiness. The relative proportion of each of these size classes in a sample of soil is estimated through their unique "feel."

Sand (except fine and very fine sand) Felt as individual grains (visible when the soil is smeared on the finger).

Fine and very fine sand When dry, feels similar to silt; when wet, it is not soapy or slippery, stiffer than silt (like grinding compound or fine sandpaper).

Silt When dry, feels floury; when wet feels slippery and soapy, slightly sticky.

Clay When dry, forms hard lumps; when moist it is plastic and pliable like plasticine; when wet it is very sticky.

Most soils are a mixture of sand, silt, and clay, so the degree of graininess, soapiness, or stickiness will vary depending on how much of each particle size is present. As the amount of clay increases, soil particles bind together, form a stronger cast, and can be rolled into thinner, longer, stronger, and more pliable "worms." As sand and silt increase, the soil binding strength decreases, and only a weak to moderately strong cast can be formed. The various soil texture classes, shown on the textural triangle at the bottom of the "Key to Identification of Soil Texture" below, are named by a combination of the dominant particle sizes. The loam texture class contains a relatively even mix of the three size classes.

The **coarse fragment** component of soils consists of particles >2 mm in diameter (for non-spherical particles measure second-largest dimension). It is divided into three classes: **gravels** (2–75 mm), **cobbles** (75–250 mm) and **stones** (>250 mm). Coarse fragment content of a soil is visually estimated as a percentage of the whole soil (by volume). That is the % gravel + % cobbles + % stones + % fine fraction (sand, silt, and clay) = 100% of mineral soil volume.

Field determination of soil texture is subjective and can only be done consistently with training followed by practice. Most coarse fragments (particles >2 mm) must be removed to enable precise assessment of soil texture. A small 2 mm sieve helps. The field tests outlined on Table A9.1 and used in conjunction with the accompanying flowchart, are provided to assist the user in the field determination of soil texture.

Graininess Test Rub the soil between your fingers. If sand is present, it will feel "grainy." Determine whether this makes up more than about 50% of the sample. Sandy soils often sound gritty when worked in the hand.

Moist Cast Test Compress some moist (not wet) soil by clenching it in your hand. If the soil holds together in a shape when released (i.e., forms a cast), then test the durability of the cast by tossing it from hand to hand. A very weak cast will immediately break up even when tossed gently. A weak cast will retain its overall shape with one or two gentle tosses but will break up with a larger number or more vigorous tosses. A moderate cast will retain its overall shape with gentle to moderate tosses but the details of the cast such as finger impressions and ridges will quickly be rounded out or subdued and will soon disappear. A strong cast will retain its overall shape with vigorous tosses; details of the cast, including finger impressions and ridges, will be retained after a few moderate tosses but will eventually be subdued with several vigorous tosses. A very strong cast will retain its overall shape as well as the details of its form with moderate to vigorous tosses.

Stickiness Test Wet the soil thoroughly and knead it to a soft putty-like consistency. The correct moisture content is important. If the soil putty flows with the force of gravity it is too wet. If it crumbles when rolled it is too dry. Gently squeeze the putty between the thumb and forefinger. Determine the stickiness by noting how strongly the soil adheres to your digits when you release the pressure and how much it stretches. Stickiness increases with increasing clay content.

Taste Test Work a small amount of soil between your front teeth. Sand particles are distinguished as individual grains (graininess), which grate sharply against the teeth. Silt particles are distinguished as a general fine "grittiness" similar to the grit found in toothpaste. Clay particles have no grittiness.

Soapy (Slipperiness) Test Work some wet soil between the thumb and forefinger. The degree of soapiness is determined by how soapy/ slippery it feels and how much resistance to slip there is (i.e., from clay and sand particles).

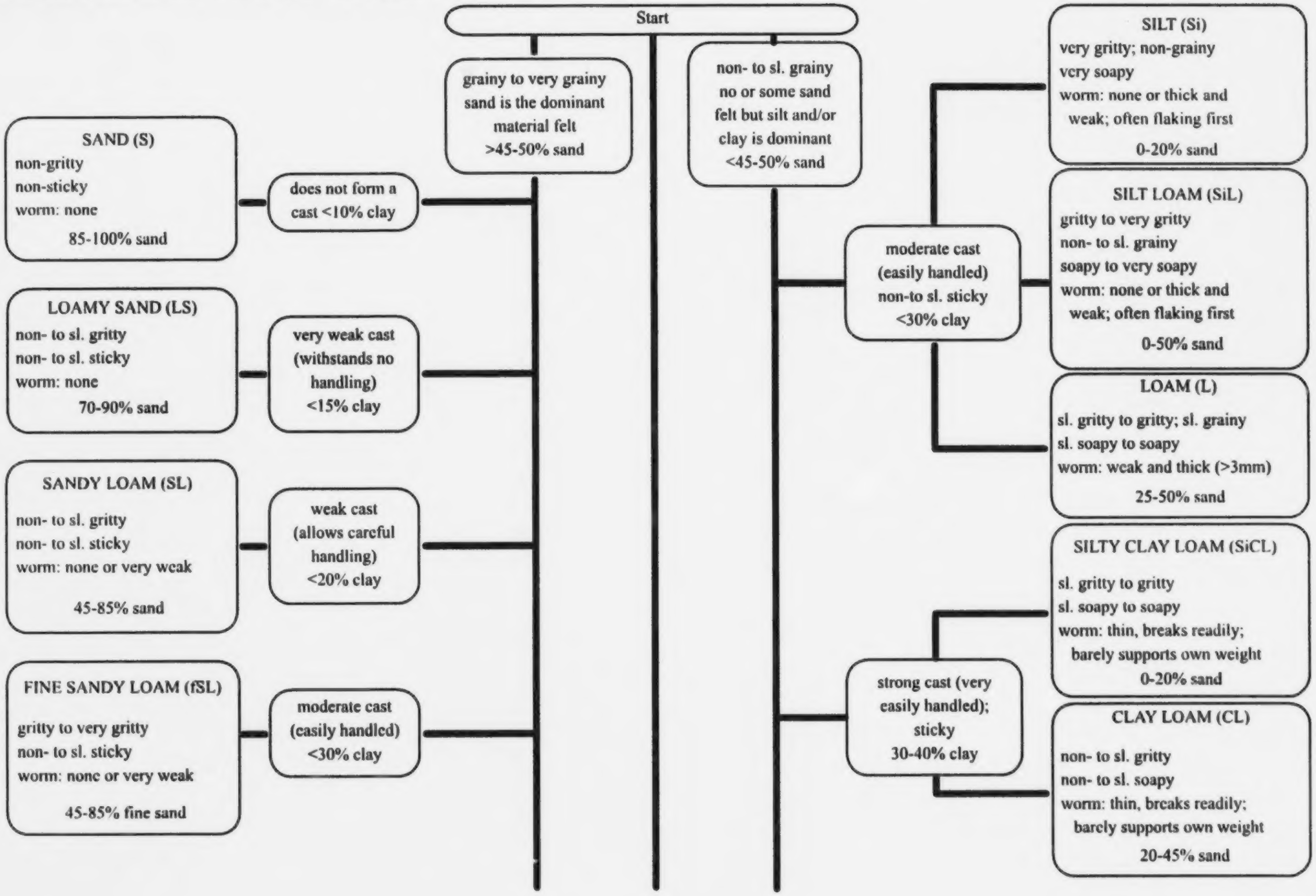
Worm Test Roll some of the soil putty in the palm with your finger to form the longest, thinnest "worm" possible. The more clay there is in the soil, the longer, thinner, and more durable and pliable the worm will be. Try with wetter or drier soil to ensure that you have the right moisture content (the best worm).

Shine Test A small amount of moist soil is rolled into a ball and rubbed once or twice against a hard , smooth object such as a knife blade or thumb nail. The more shiny the soil the greater the proportion of clay.

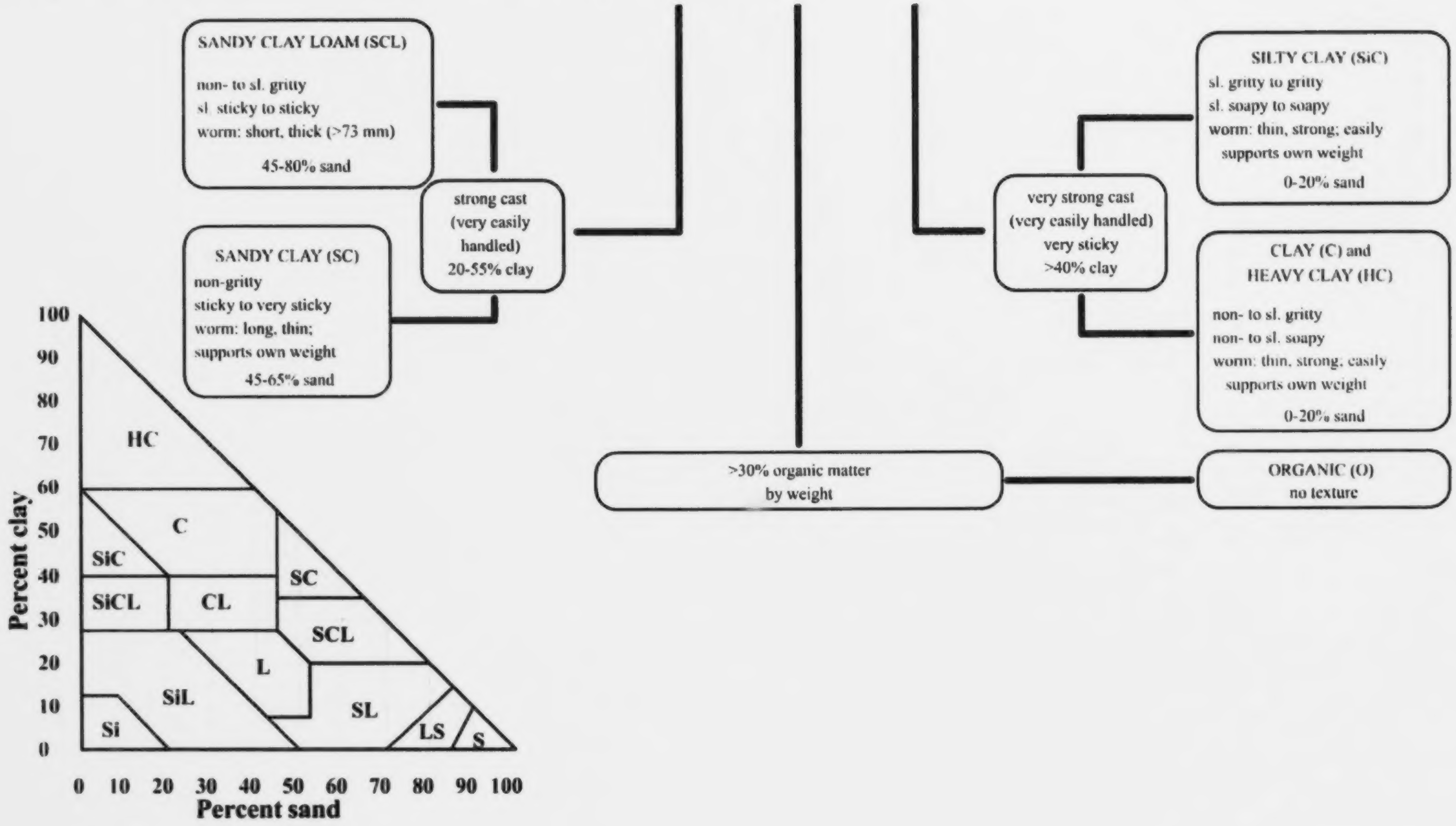
Well-decomposed organic matter (humus) imparts some silt-like properties to the soil. These soils feel floury when dry and slippery and spongy when moist, but not sticky or plastic. However, when subjected to the taste test, they feel non-gritty. They are generally very dark when moist or wet, and stain the hands brown or black. Humus-enriched soils often occur on wet sites, under deciduous forests and in grasslands. Humus is not used as a determinant of soil texture; an estimate of the silt content of any humus-enriched mineral soil should be reduced accordingly.

Organic soils and soil horizons are those that contain more than 30% organic matter by weight. Soil texture is not determined on these. Most organic soils and deep organic horizons are found on wet sites, often in depressions or on floodplains, and also in association with dense moss cover.

Key to Identification of Soil Texture


Start
grainy to very grainy sand is the dominant material felt >45-50% sand
non- to sl. grainy no or some sand felt but silt and/or clay is dominant <45-50% sand
does not form a cast <10% clay
SAND (S) non-gritty non-sticky worm: none 85-100% sand
very weak cast (withstands no handling) <15% clay
LOAMY SAND (LS) non- to sl. gritty non- to sl. sticky worm: none 70-90% sand
weak cast (allows careful handling) <20% clay
SANDY LOAM (SL) non- to sl. gritty non- to sl. sticky worm: none or very weak 45-85% sand
moderate cast (easily handled) <30% clay
FINE SANDY LOAM (fSL) gritty to very gritty non- to sl. sticky worm: none or very weak 45-85% fine sand
moderate cast (easily handled) non-to sl. sticky <30% clay
SILT (Si) very gritty; non-grainy very soapy worm: none or thick and weak; often flaking first 0-20% sand
SILT LOAM (SiL) gritty to very gritty non- to sl. grainy soapy to very soapy worm: none or thick and weak; often flaking first 0-50% sand
LOAM (L) sl. gritty to gritty; sl. grainy sl. soapy to soapy worm: weak and thick (>3mm) 25-50% sand
strong cast (very easily handled); sticky 30-40% clay
SILTY CLAY LOAM (SiCL) sl. gritty to gritty sl. soapy to soapy worm: thin, breaks readily; barely supports own weight 0-20% sand
CLAY LOAM (CL) non- to sl. gritty non- to sl. soapy worm: thin, breaks readily; barely supports own weight 20-45% sand

Key to Identification of Soil Texture (continued)



strong cast
(very easily
handled)
20-55% clay

SANDY CLAY LOAM (SCL)
non- to sl. gritty
sl. sticky to sticky
worm: short, thick (>73 mm)
45-80% sand

SANDY CLAY (SC)
non-gritty
sticky to very sticky
worm: long, thin;
supports own weight
45-65% sand

very strong cast
(very easily handled)
very sticky
>40% clay

SILTY CLAY (SiC)
sl. gritty to gritty
sl. soapy to soapy
worm: thin, strong; easily
supports own weight
0-20% sand

CLAY (C) and
HEAVY CLAY (HC)
non- to sl. gritty
non- to sl. soapy
worm: thin, strong, easily
supports own weight
0-20% sand

>30% organic matter
by weight

ORGANIC (O)
no texture

Percent clay
100
90
80
70
60
50
40
30
20
10
0
HC
C
SiC
SiCL
CL
SC
SCL
L
SiL
Si
SL
LS
S
0 10 20 30 40 50 60 70 80 90 100
Percent sand

TABLE A9.1 Field test characteristics of soil texture classes[a]

Texture class	Feel test		Moist cast test	Worm test	Taste test	Shine test
	Dry	Wet				
Sand	grainy with no floury material	non- soapy; non- sticky	none	none	non-gritty	n/a
Loamy sand	grainy with small amount of floury material	non- to slightly soapy; slightly sticky	very weak cast, withstands no handling	none	slightly gritty; graininess dominates	n/a
Sandy loam	substantial graininess with considerable amount of floury material	non- to slightly soapy; slightly sticky	weak cast, allows careful handling	none to barely forming a weak worm	slightly gritty; considerable graininess	n/a
Fine sandy loam	substantial fine graininess with a considerable amount of floury material	non- to slightly soapy; slightly sticky	moderate cast, easily handled	weak, coarse worm	gritty to very gritty; (coarser grittiness of fine sand)	n/a
Loam	fairly soft and smooth with evident graininess	slightly soapy to soapy; slightly sticky	moderate cast, readily handled	weak, coarse worm	slightly gritty to gritty; evident graininess	n/a

TABLE A9.1 Field test characteristics of soil texture classes (continued)

Texture class	Feel test		Moist cast test	Worm test	Taste test	Shine test
	Dry	Wet				
Silt loam	floury; slight graininess	soapy to very soapy; slightly sticky	moderate cast, readily handled	weak, coarse worm, flakes rather than forms worm	gritty to very gritty; slight graininess	n/a
Silt	very floury; non-grainy	very soapy; slightly sticky	moderate cast, readily handled	weak, coarse worm, flakes rather than forms worm	very gritty; little or no sand felt	n/a
Sandy clay loam	non- to slightly floury; substantial graininess	slightly soapy to soapy; slightly sticky to sticky	strong cast, very easily handled	forms a moderately thick worm that breaks relatively easily	non-gritty to slightly gritty	slightly shiny
Clay loam	non- to slightly floury; moderate graininess	non-soapy to slightly soapy; sticky	strong cast, very easily handled	forms a thin worm that breaks readily and barely supports its own weight	non-gritty to slightly gritty	slightly shiny

TABLE A9.1 Field test characteristics of soil texture classes (continued)

Texture class	Feel test		Moist cast test	Worm test	Taste test	Shine test
	Dry	Wet				
Silty clay loam	smooth and floury; non-grainy to slightly grainy	slightly soapy to soapy; sticky	strong cast, very easily handled	forms a fairly thin but weak worm that barely supports its own weight and breaks easily	slightly gritty to gritty	slightly shiny
Sandy clay	substantial graininess	non- to slightly soapy; sticky to very sticky	strong cast, very easily handled	forms a thin, relatively long worm that supports its own weight and is relatively pliable	non-gritty; substantial amount of sand grains felt	moderately shiny
Silty clay	smooth, without graininess	slightly soapy to soapy; very sticky	very strong cast, very easily handled	forms a strong, very pliable, thin worm that easily supports its own weight	slightly gritty to gritty; little or no sand felt	moderately shiny
Clay and heavy clay	smooth, with little to moderate graininess	non- to slightly soapy; very sticky	very strong cast, very easily handled	forms a strong, very pliable, thin worm that easily supports its own weight	non- to slightly gritty; little to moderate amount of sand felt	very shiny

[a] Adapted from Bélisle, J. (editor). 1980. Field manual for describing soils. Ontario Institute of Pedology. Guelph, Ont.

APPENDIX 10
SOIL PARTICLE SIZE CLASSIFICATION

Soil particle size classification is based on the proportion (relative volume) of all particle size classes in the soil, including the proportion of sand (0.05–2.0 mm), silt (0.002–0.05 mm), and clay (<0.002 mm) sized particles as well as the proportion of coarse fragments (>2.0 mm), including gravels (2–75 mm), cobbles (75–250 mm), and stones (>250 mm). The classification on the following table was developed for, and is intended only for purposes of, this guide to ecosystems of the Cariboo Forest Region. See Appendix 9 for a guide to identification of soil texture classes.

TABLE A10.1 Soil particle size classification

Particle size class	Soil texture class and coarse fragment content by volume
Very coarse	• sand and loamy sand textures (except very fine sand and loamy very fine sand [a]) with >35% coarse fragments
Coarse	• sand and loamy sand textures (except very fine sand and loamy very fine sand) with <35% coarse fragments • very fine sand and loamy very fine sand textures with >35% coarse fragments • sandy loam, loam, and sandy clay loam soils with >70% coarse fragments
Medium	• very fine sand and loamy very fine sand textures with <35% coarse fragments • sandy loam, loam, and sandy clay loam textures with <70% coarse fragments • silt loam and silt textures with >20% coarse fragments • silty clay loam and clay loam textures with >35% coarse fragments
Fine	• silt loam and silt textures with <20% coarse fragments • silty clay loam, clay loam, sandy clay, silty clay, clay, and heavy clay soils with <35% coarse fragments

[a] Very fine sand and loamy very fine sand are sand and loamy sand textures respectively in which more than 50% of the sand-sized particles are smaller than 0.10 mm in diameter. They are close to silt and silt loam textures.

APPENDIX 11

GUIDE TO THE IDENTIFICATION OF SOIL ORDERS AND GREAT GROUPS

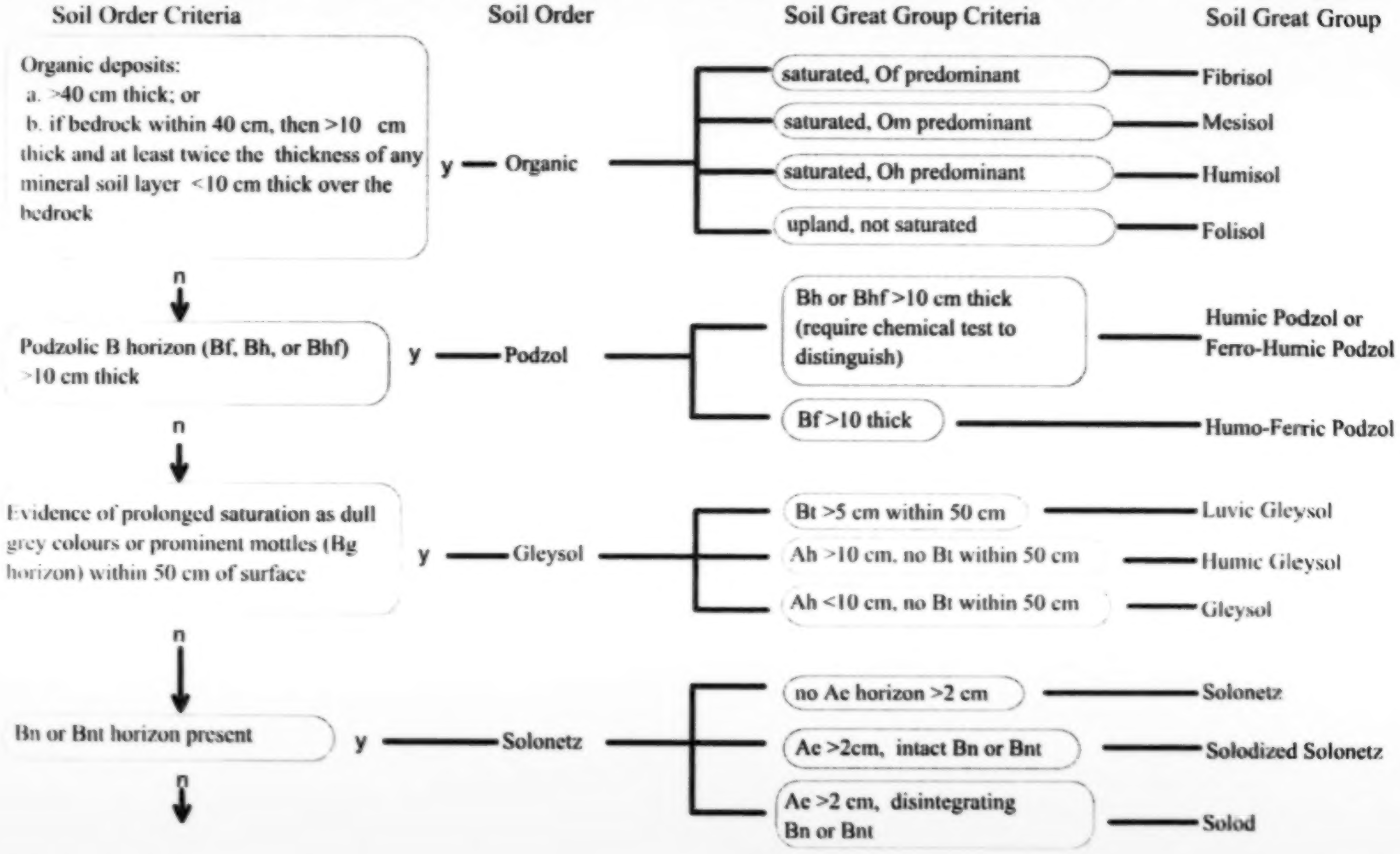
The following guide to soil orders and great groups is designed to aid field staff in identifying soil orders and great groups that occur in the Cariboo Forest Region. Soil order and great group nomenclature follows the Canadian system of soil classification (Agriculture Canada Expert Committee on Soil Survey 1987). This guide provides relatively non-technical summaries of Agriculture Canada Expert Committee on Soil Survey (1987) definitions and is intended for general field classification with few chemical tests or detailed colour descriptions. It will correctly assist the classification of most but not all soils in the Cariboo Forest Region. See Agriculture Canada Expert Committee on Soil Survey (1987) for a comprehensive and more detailed definition of soil orders and great groups. Soil horizons that are important for classifying soils to the great group level in the Cariboo Forest Region are described below.

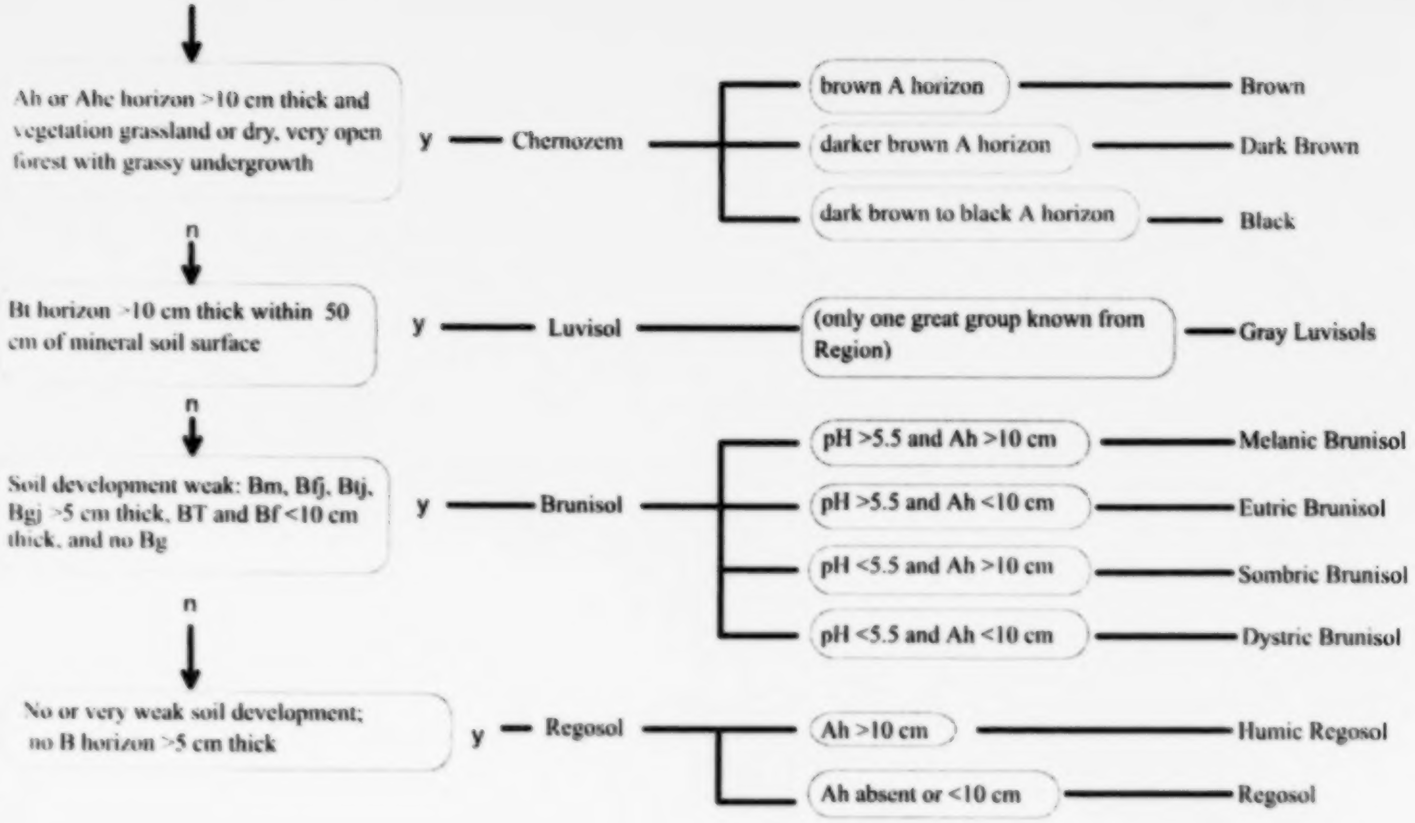
Designation	Definition
Ae	Surface mineral horizon from which iron, aluminum, organic matter, or clay have been partially leached out alone or in combination. When dry, an Ae is usually lighter coloured than the underlying B horizon.
Ah	Surface mineral horizon darkened (compared to parent material) due to enrichment with organic matter.
Ahe	Surface mineral horizon characterized by streaks and splotches of different shades of grey due to enrichment with organic matter but leaching out of iron, aluminum, or clay. It is often overlain by an Ah and underlain by an Ae.
Bf	A subsurface horizon that is reddish brown to red due to enrichment with iron and aluminum but with little organic matter enrichment.

Bg	A subsurface or surface horizon with gleyed (dull grey) colours or mottles (orange or reddish splotches) indicative of persistent or periodic anaerobic saturation.
Bh	A subsurface horizon that is dark brown to black due to accumulation of organic compounds moved downward from the A horizon; little iron or aluminum enrichment.
Bhf	A subsurface horizon that is dark reddish brown due to enrichment with iron, aluminum, and organic matter.
Bm	A subsurface or surface horizon that is brownish or slightly reddish due to only slight alteration by oxidation, leaching, or weathering. The accumulation of iron and aluminum or clay is too slight to qualify as Bf or Bt.
Bn	A subsurface horizon with prismatic or columnar structure that is hard when dry; dark organic coatings are usually present on surface of soil peds.
Bnt	A subsurface horizon that meets definition of both the Bn and Bt.
Bt	A subsurface horizon that is enriched with clay, moved downward from an A horizon. It is often browner than overlying or underlying layers. A Bt horizon must be at least 5 cm thick.
j	Symbol used with suffixes “e”, “f”, “g”, and “t” to indicate that criteria for the suffix are weakly expressed or “juvenile” and do not meet specified limits (e.g., Bgj).

Of, Om, Oh	Organic horizons developed mainly from mosses, sedges, rushes, and woody materials under anaerobic water saturation. The suffix indicates the state of decomposition: f - fibric; little decomposed; m - mesic; moderately decomposed; h - humic, well decomposed.

Guide to the identification of soil orders and great groups in the Cariboo Forest Region


Soil Order Criteria
Soil Order
Soil Great Group Criteria
Soil Great Group
Organic deposits:
a. >40 cm thick; or
b. if bedrock within 40 cm, then >10 cm thick and at least twice the thickness of any mineral soil layer <10 cm thick over the bedrock
y
Organic
saturated, Of predominant
Fibrisol
saturated, Om predominant
Mesisol
saturated, Oh predominant
Humisol
upland, not saturated
Folisol
n
Podzolic B horizon (Bf, Bh, or Bhf) >10 cm thick
y
Podzol
Bh or Bhf >10 cm thick (require chemical test to distinguish)
Humic Podzol or Ferro-Humic Podzol
Bf >10 thick
Humo-Ferric Podzol
n
Evidence of prolonged saturation as dull grey colours or prominent mottles (Bg horizon) within 50 cm of surface
y
Gleysol
Bt >5 cm within 50 cm
Luvic Gleysol
Ah >10 cm, no Bt within 50 cm
Humic Gleysol
Ah <10 cm, no Bt within 50 cm
Gleysol
n
Bn or Bnt horizon present
y
Solonetz
no Ae horizon >2 cm
Solonetz
Ae >2cm, intact Bn or Bnt
Solodized Solonetz
Ae >2 cm, disintegrating Bn or Bnt
Solod
n


Ah or Ahe horizon >10 cm thick and vegetation grassland or dry, very open forest with grassy undergrowth
y
Chernozem
brown A horizon
Brown
darker brown A horizon
Dark Brown
dark brown to black A horizon
Black
n
Bt horizon >10 cm thick within 50 cm of mineral soil surface
y
Luvisol
(only one great group known from Region)
Gray Luvisols
n
Soil development weak: Bm, Bfj, Btj, Bgj >5 cm thick, BT and Bf <10 cm thick, and no Bg
y
Brunisol
pH >5.5 and Ah >10 cm
Melanic Brunisol
pH >5.5 and Ah <10 cm
Eutric Brunisol
pH <5.5 and Ah >10 cm
Sombric Brunisol
pH <5.5 and Ah <10 cm
Dystric Brunisol
n
No or very weak soil development; no B horizon >5 cm thick
y
Regosol
Ah >10 cm
Humic Regosol
Ah absent or <10 cm
Regosol

Reference

Agriculture Canada Expert Committee on Soil Survey. 1987. The Canadian system of soil classification. 2nd edition. Agric. Can. Publl. 1646.

APPENDIX 12
CHARACTERISTICS OF HUMUS FORM ORDERS

The following table is provided as an aid to identification of humus forms to the order level through readily observable characteristics. Some of these characteristics are most easily observed with a 10X hand lens.

Definition of terms:

Ah horizon is a mineral soil horizon formed at or near the soil surface and enriched with organic matter, resulting in a darkened colour.

L F H horizons are soil surface organic horizons in which the organic material is derived primarily from the accumulation of leaves, twigs, and woody materials with or without a minor component of mosses; usually not saturated with water for long periods of time.

> **L horizon** is a surface organic horizon (litter layer) consisting of relatively fresh organic residue with relatively little decomposition and in which virtually entire original structures are discernible (foliage, twigs, wood, etc.).
>
> **F horizon** is a surface organic horizon (fermented layer) in which organic residues are partially decomposed but may still be identified as to their origin.
>
> **H horizon** is a surface organic horizon (humus layer) dominated by well-decomposed organic material where the original structures are no longer discernible.

O horizons are horizons of an organic soil (see Appendix 11) in which the organic materials (Of, Om, Oh) are derived primarily from mosses, sedges, rushes, and woody materials; humus-forming processes are characteristically influenced by saturated soil conditions.

Fungal mycelia are a mass of thread-like filaments that constitute the "vegetative" phase of fungal development; many are coloured (brown, black, grey, white, red, or yellow), others are transparent; abundant in F horizon of Mor humus forms.

TABLE A12.1 Distinguishing characteristics of humus form

Criteria	Mor	Moder	Mull
Mode of decomposition	predominantly fungi	soil fauna, bacteria and fungi	soil fauna, including earthworms, and bacteria
Structure of F horizon	matted; fungal mycelia common to abundant	loose; few fungal mycelia, insect droppings visible	F horizon usually very thin or absent
Mineral and organic material intermixing	uncommon; usually a sharp boundary between organic and mineral horizons	often some mineral particles mixed into the H horizon	high degree of incorporation of organic material into mineral soil (Ah >2 cm)

For a complete classification of humus forms to the group level see Green, R., R.L. Trowbridge, and K. Klinka. 1993. Towards a taxonomic classification of humus forms. For. Sci. Monogr. 29.

APPENDIX 13
COMMON AND SCIENTIFIC NAMES OF PLANT SPECIES MENTIONED IN THIS GUIDE

Common Name	**Scientific Name**
alder, mountain	*Alnus tenuifolia*
alder, red	*Alnus rubra*
alder, Sitka	*Alnus crispa* ssp. *sinuata*
alumroot, round-leaved	*Heuchera cylindrica*
arnica	*Arnica* spp.
arnica, heart-leaved	*Arnica cordifolia*
arnica, mountain	*Arnica latifolia*
aspen, trembling	*Populus tremuloides*
aster, great northern	*Aster modestus*
aster, Lindley's	*Aster ciliolatus*
aster, showy	*Aster conspicuus*
avens, large-leaved	*Geum macrophyllum*
avens, water	*Geum rivale*
balsamroot, arrow-leaved	*Balsamorhiza sagittata*
baneberry	*Actaea rubra*
bastard toad-flax	*Geocaulon lividum*
bedstraw, sweet-scented	*Galium triflorum*
birch, paper	*Betula papyrifera*
birch, scrub	*Betula glandulosa*
birch, water	*Betula occidentalis*
blue flax, western	*Linum perenne* ssp. *lewisii*
blueberry, Alaskan	*Vaccinium alaskaense*
blueberry, dwarf	*Vaccinium caespitosum*
blueberry, oval-leaved	*Vaccinium ovalifolium*
blueberry, velvet-leaved	*Vaccinium myrtilloides*
bluegrass, alpine	*Poa alpina*
bluegrass, Sandberg's	*Poa secunda*
bog-laurel, western	*Kalmia microphylla*
bog-rosemary	*Andromeda polifolia*

Common Name	**Scientific Name**
brown mosses	*Tomenthypnum nitens* and/or *Aulacomnium palustre* and/or *Drepanocladus* spp. and others
bunchberry	*Cornus canadensis*
burnet, Sitka	*Sanguisorba canadensis*
butterweed, Rocky Mountain	*Senecio streptanthifolius*
butterweed, streambank	*Senecio pseudaureus*
cherry, choke	*Prunus virginiana*
cinquefoil, diverse-leaved	*Potentilla diversifolia*
cinquefoil, marsh	*Potentilla palustris*
cladina lichens	*Cladina* spp.
cladonia lichens	*Cladonia* spp.
clubmoss, stiff	*Lycopodium annotinum*
coltsfoot, palmate	*Petasites frigidus* var. *palmatus*
columbine, red	*Aquilegia formosa*
comandra, pale	*Comandra umbellata* var. *pallida*
cotton-grasses	*Eriophorum* spp.
cottonwood, black	*Populus balsamifera* ssp. *trichocarpa*
cow-parsnip	*Heracleum lanatum*
cranberry, bog	*Oxycoccus oxycoccos*
creeping-snowberry	*Gaultheria hispidula*
crowberry	*Empetrum nigrum*
currant, skunk	*Ribes glandulosum*
daisy, cut-leaved	*Erigeron compositus*
daisy, line-leaved	*Erigeron linearis*
daisy, subalpine	*Erigeron peregrinus*
death-camas, meadow	*Zigadenus venenosus*
desert-parsley, large-fruited	*Lomatium macrocarpum*
devil's club	*Oplopanax horridus*
dog lichen	*Peltigera canina*
dogbane, spreading	*Apocynum androsaemifolium*
dogwood, red-osier	*Cornus stolonifera*
Douglas-fir	*Pseudotsuga menziesii*
drabas	*Draba* spp.
dropseed, sand	*Sporobolus cryptandrus*
elderberry, red	*Sambucus racemosa*

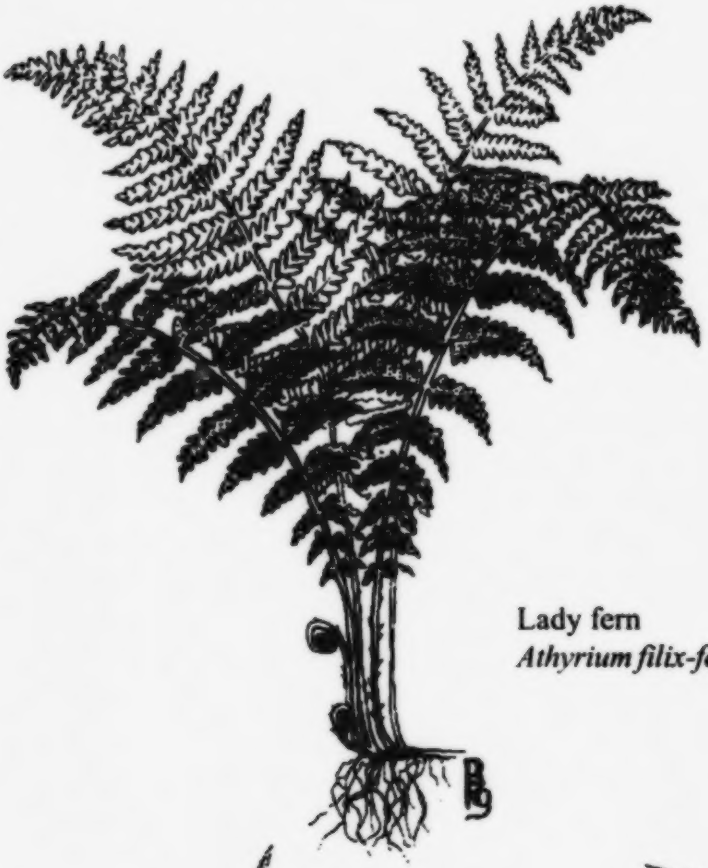
Common Name	**Scientific Name**
enchanter's nightshade	*Circaea alpina*
fairybells, Hooker's	*Disporum hookeri*
fairybells, rough-fruited	*Disporum trachycarpum*
false azalea	*Menziesia ferruginea*
false Solomon's-seal	*Smilacina racemosa*
false Solomon's-seal, star-flowered	*Smilacina stellata*
falsebox	*Pachistima myrsinities*
feathermoss, red-stemmed	*Pleurozium schreberi*
feathermosses (boreal)	*Pleurozium schreberi,* *Ptilium crista-castrensis,* *Hylocomium splendens*
fern, lady	*Athyrium filix-femina*
fern, oak	*Gymnocarpium dryopteris*
fern, ostrich	*Matteuccia struthiopteris*
fern, spiny wood	*Dryopteris expansa* syn. = *D. assimilis*
fescue, Altai	*Festuca altaica*
fescue, Rocky Mountain	*Festuca saximontana*
fescue, western	*Festuca occidentalis*
fir, amabilis	*Abies amabilis*
fir, subalpine	*Abies lasiocarpa*
fireweed	*Epilobium angustifolium*
five-leaved bramble	*Rubus pedatus*
foamflowers	*Tiarella trifoliata*
foamflower, one-leaved	*Tiarella trifoliata* var. *unifoliata*
foamflower, three-leaved	*Tiarella trifoliata* var. *trifoliata*
globeflower	*Trollius laxus*
goldenrod, northern	*Solidago multiradiata*
goldenrod, spike-like	*Solidago spathulata*
golden-saxifrage, northern	*Chrysosplenium tetrandrum*
gooseberry, black	*Ribes lacustre*
gooseberry, northern	*Ribes oxyacanthoides*
grass, needle-and-thread	*Stipa comata*
grass, short-awned porcupine	*Stipa curtiseta*
grass-of-Parnassus, fringed	*Parnassia fimbriata*
groundsel, arrow-leaved	*Senecio triangularis*
grouseberry	*Vaccinium scoparium*

Common Name	**Scientific Name**
hairgrass, mountain	*Vahlodea atropurpurea*
hawkweed, white	*Hieracium albiflorum*
hazelnut, beaked	*Corylus cornuta*
hemlock, western	*Tsuga heterophllya*
hemlock, mountain	*Tsuga mertensiana*
highbush-cranberry	*Viburnum edule*
honeysuckle, Utah	*Lonicera utahensis*
horsetails	*Equisetum* spp.
horsetail, common	*Equisetum arvense*
horsetail, meadow	*Equisetum pratense*
huckleberry, black	*Vaccinium membranaceum*
Indian hellebore	*Veratrum viride*
Jacob's-ladder, tall	*Polemonium caeruleum*
junegrass	*Koeleria macrantha*
juniper, common	*Juniperus communis*
juniper, Rocky Mountain	*Juniperus scopulorum*
kinnikinnick	*Arctostaphylos uva-ursi*
knight's plume	*Ptilium crista-castrensis*
Labrador tea	*Ledum groenlandicum*
lemonweed	*Lithospermum ruderale*
lily, tiger	*Lilium columbianum*
lousewort	*Pedicularis* spp.
lousewort, bracted	*Pedicularis bracteosa*
lupine, arctic	*Lupinus arcticus*
maple, Douglas	*Acer glabrum*
meadowrue, western	*Thalictrum occidentale*
milk-vetch, timber	*Astragalus miser*
mitrewort, common	*Mitella nuda*
moss, electrified cat's-tail	*Rhytidiadelphus triquetrus*
moss, glow	*Aulacomnium palustre*
moss, golden fuzzy fen	*Tomenthypnum nitens*
moss, grey frayed-cap	*Racomitrium canescens*
moss, juniper haircap	*Polytrichum juniperinum*
mosses, leafy	*Mnium* spp., *Plagiomnium* spp., *Rhizomnium* spp.
moss, pipecleaner	*Rytidiopsis robusta*
moss, sickle	*Sanionia uncinatus* syn. = *Drepanocladus uncinatus*

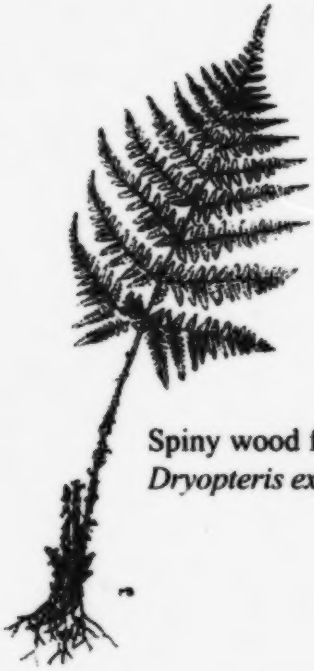
Common Name	**Scientific Name**
moss, sphagnum	*Sphagnum* spp.
moss, step	*Hylocomium splendens* and/or *Rhizomnium* spp.
moss, wavy-leaved	*Dicranum polysetum*
moss, woodsy ragged	*Brachythecium hylotapetum*
mountain-ash, western	*Sorbus scopulina*
mountain-heather, pink	*Phyllodoce empetriformis*
nagoonberry	*Rubus arcticus*
needlegrass, spreading	*Stipa richardsonii*
oatgrass, timber	*Danthonia intermedia*
onion, nodding	*Allium cernuum*
Oregon-grape, tall	*Mahonia aquifolium*
paintbrushes	*Castilleja* spp.
partridgefoot	*Luetkea pectinata*
pasqueflower, western	*Anemone occidentalis*
peavine, creamy	*Lathyrus ochroleucus*
pelt lichens	*Peltigera* spp.
pelt, apple	*Peltigera malacea*
pelt, felt	*Pelfigera, rufescens*
pelt, freckle	*Peltigera aphthosa*
penstemon, shrubby	*Penstemon fruticosus*
pine, lodgepole	*Pinus contorta*
pine, ponderosa	*Pinus ponderosa*
pine, western white	*Pinus monticola*
pine, whitebark	*Pinus albicaulis*
pinegrass	*Calamagrostis rubescens*
prickly-pear cactus, brittle	*Opuntia fragilis*
prince's pine	*Chimaphila umbellata*
pussytoes, field	*Antennaria neglecta*
pussytoes, low	*Antennaria dimorpha*
pussytoes, racemose	*Antennaria racemosa*
pussytoes, umber	*Antennaria umbrinella*
queen's cup	*Clintonia uniflora*
rabbit-brush, common	*Chrysothamnus nauseosus*
raspberry, red	*Rubus idaeus*
raspberry, trailing	*Rubus pubescens*
rattlesnake-plantain	*Goodyera oblongifolia*
redcedar, western	*Thuja plicata*
reedgrass, bluejoint	*Calamagrostis canadensis*

Common Name	**Scientific Name**
reedgrass, purple	*Calamagrostis purpurascens*
rhododendron, white-flowered	*Rhododendron albiflorum*
ricegrass, rough-leaved	*Oryzopsis asperifolia*
ricegrass, short-awned	*Oryzopsis pungens*
rockcress, Holboell's	*Arabis holboellii*
rose, prickly	*Rosa acicularis*
sage, prairie	*Artemisia frigida*
sagebrush, big	*Artemisia tridentata*
sagewort, mountain	*Artemisia norvegica*
salsify, meadow	*Tragopogon pratensis*
saskatoon	*Amelanchier alnifolia*
saxifrage, leatherleaf	*Leptarrhena pyrolifolia*
scouring-rush, dwarf	*Equisetum scirpoides*
sedges	*Carex* spp.
sedge, water	*Carex aquatilis*
sedge, northwestern	*Carex concinnoides*
sedge, soft-leaved	*Carex disperma*
selaginella, compact	*Selaginella densa*
skunk cabbage	*Lysichiton americanum*
snowberry, common	*Symphoricarpos albus*
soopolallie	*Shepherdia canadensis*
spirea, birch-leaved	*Spiraea betulifolia*
spirea, pink	*Spiraea douglasii* ssp. *menziesii*
spruce, black	*Picea mariana*
spruce, Engelmann	*Picea engelmannii*
spruce, hybrid white	*Picea engelmannii* x *glauca*
spruce, Sitka	*Picea sitchensis*
spruce, white	*Picea glauca*
stinging nettle	*Urtica dioica*
stonecrop	*Sedum* spp.
stonecrop, lance-leaved	*Sedum lanceolatum*
strawberry, wild	*Fragaria virginiana*
sweet-cicely, mountain	*Osmorhiza chilensis*
thimbleberry	*Rubus parviflorus*
trapper's tea	*Ledum glandulosum*
twayblade, heart-leaved	*Listera cordata*
twinflower	*Linnaea borealis*

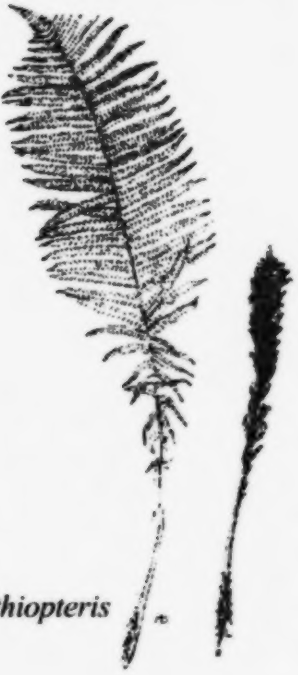
Common Name	**Scientific Name**
twistedstalk, clasping	*Streptopus amplexifolius*
twistedstalk, rosy	*Streptopus roseus*
valerian, Sitka	*Valeriana sitchensis*
vetch, American	*Vicia americana*
violet, Canada	*Viola canadensis*
violet, early blue	*Viola adunca*
wheatgrass, bluebunch	*Elymus spicatus* syn. = *Agropyron spicatum*
wild sarsaparilla	*Aralia nudicaulis*
wildrye, blue	*Elymus glauca*
willows	*Salix* spp.
willow, Bebb's	*Salix bebbiana*
willow, bog	*Salix pedicellaris*
willow, grey-leaved	*Salix glauca*
willow, Scouler's	*Salix scouleriana*
willows, dwarf	*Salix arctica* and *S. reticulata* ssp. *nivalis*
wintergreen, one-sided	*Orthilia secunda*
wintergreen, pink	*Pyrola asarifolia*
wintergreen, white-veined	*Pyrola picta*
wood-reed, nodding	*Cinna latifolia*
yarrow	*Achillea millefolium*
yellow-cedar	*Chamaecyparis nootkatensis*
yew, western	*Taxus brevifolia*



Lady fern
Athyrium filix-femina

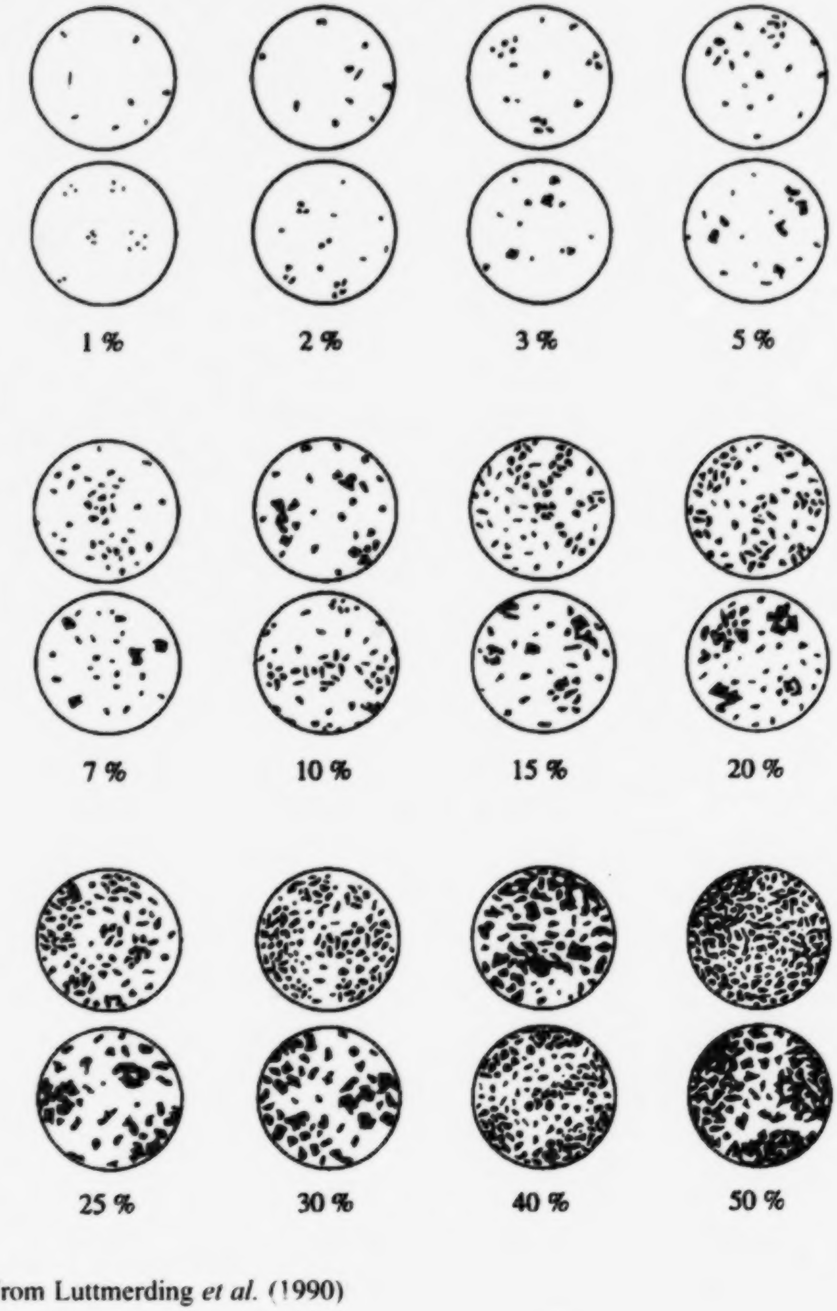


Spiny wood fern
Dryopteris expansa



Ostrich fern
Matteuccia struthiopteris

APPENDIX 14
COMPARISON CHARTS FOR VISUAL ESTIMATION OF FOLIAGE COVER[a]


1 %
2 %
3 %
5 %
7 %
10 %
15 %
20 %
25 %
30 %
40 %
50 %

---

[a] From Luttmerding *et al.* (1990)

Reference

Luttmerding, H.A., D.A. Demarchi, E.C. Lea, D.V. Meidinger, and T. Vold (editors). 1990, Describing ecosystems in the field, 2nd ed. B.C. Min. Environ., Victoria, B.C. Manual No. 11.

APPENDIX 15
DESCRIPTION OF VEGETATION SUBCOMPLEXES LISTED IN SILVICULTURE CONSIDERATIONS TABLES

Newton and Comeau (1990) list 22 vegetation complexes for British Columbia. Nine of these dominate at least some cutover sites in the Cariboo Forest Region: Dry alder, Dry shrub, Ericaceous shrub, Fern, Mixed hardwood, Mixed shrub, Pinegrass, Subalpine herb, and Fireweed. Other vegetation complexes including the Cottonwood, Cottonwood-alder, Aspen, Boreal poplar, Wet alder, Willow, Reedgrass, and Introduced grasses are also present but are either not common or do not dominate cutover sites.

The nine vegetation complexes that dominate cutover areas in the Cariboo Forest Region have been subdivided into a total of 31 vegetation subcomplexes based on differences in vegetation structure or species composition. The tables on the following pages summarize the structure and some of the principal species making up the vegetation of each of these subcomplexes.

Structure of the vegetation of these subcomplexes is summarized in the tables by describing the abundance (ground cover) of each of the following vegetation strata:

tall shrubs	all woody plants 2–10 m tall;
low shrubs	all woody plants less than 2 m tall, except those considered to be dwarf shrubs;
dwarf shrubs	woody or semiwoody plants that are decumbent or lying on the soil surface and less than 10 cm tall;
tall herbs	herbaceous species (forbs and grass-like plants) that typically have a significant proportion of their leafy material at heights greater than 25 cm above the surface;
low herbs	herbaceous species less than 25 cm tall or, if taller, that do not have a significant proportion of their leafy material more than 25 cm above the surface.

Abundance (ground cover) of the vegetation strata is described according to the following cover classes:

none	vegetation stratum absent or virtually absent;
very low	vegetation stratum present but total cover typically less than 2%;
low	vegetation stratum total cover typically 2–20%;
moderate	vegetation stratum total cover typically 21–50%;
high	vegetation stratum total cover typically >50%

Principal species listed under each vegetation stratum are present on most sites of the subcomplex and typically are among the species with the greatest percent cover values within the stratum. Abundance classes of moderate and high are bolded and underlined for emphasis.

TABLE A15.1 Description of vegetation subcomplexes listed in Silviculture Consideration Tables

Vegetation Subcomplex	**Ground Cover and Principal Species by Vegetation Stratum**				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Dry alder - pinegrass	**moderate** *Sitka alder*	low *black huckleberry, birch-leaved spirea*	low *kinnikinnick, dwarf blueberry*	very low	**moderate** *pinegrass, northwestern sedge, heart-leaved arnica, twinflower*
Dry shrub - bunchgrass	low *Rocky Mountain juniper*	low *saskatoon, commmon snowberry, common juniper*	low *kinnikinnick*	none	**moderate** *bluebunch wheatgrass*
Dry shrub - dwarf ericaceous shrubs	none	low *common juniper, soopolallie*	**moderate** *grouseberry, crowberry, kinnikinnick*	none	low *heart-leaved arnica, twinflower, yarrow*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Dry shrub - falsebox	none	low - **moderate**	low	none	low - **moderate**
		falsebox, *common juniper,* *tall Oregon-grape,* *saskatoon,* *black huckleberry*	*kinnikinnick*		*twinflower, prince's pine, white-flowered hawkweed*
Dry shrub - kinnikinnick	none	low	**moderate** - **high**	none	low
		common juniper, saskatoon, prickly rose, soopolallie	*kinnikinnick*		*bunch- and sod-grasses*
Dry shrub - pinegrass	none	low	low	none	**moderate** - **high**
		soopolallie, *common juniper,* *prickly rose*	*kinnikinnick*		*pinegrass, heart-leaved arnica, showy aster, yarrow*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	Low Shrub	Dwarf Shrub	Tall Herb	Low Herb
Dry shrub - trapper's tea	none	**high**	**high**	none	low
		trapper's tea, soopolallie	*large patches of crowberry, grouseberry*		*twinflower, heart-leaved arnica, yarrow, red columbine*
Ericaceous shrub - low shrub	none - very low	low - **moderate**	none	low	low
	occasionally scattered Sitka alder or Douglas maple	*black huckleberry, velvet-leaved blueberry, falsebox, birch-leaved spirea*		*fireweed, bluejoint*	*queen's cup, twinflower, heart-leaved arnica, one-sided wintergreen*
Ericaceous shrub - rhododendron	none	**moderate** - **high**	none	low	low - **moderate**
		white-flowered rhododendron, black huckleberry, oval-leaved blueberry, Sitka mountain-ash		*Indian hellebore, Sitka valerian, fireweed*	*foamflower, queen's cup, five-leaved bramble, rosy twistedstalk*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	Low Shrub	Dwarf Shrub	Tall Herb	Low Herb
Fern - ostrich fern	**moderate** *dense patches of mountain alder, red elderberry*	low *red-osier dogwood, thimbleberry, skunk currant*	none	**high** *ostrich fern, stinging nettle, western meadowrue*	**moderate** *foamflower, enchanter's nightshade, large-leaved avens, sweet-scented bedstraw*
Mixed hardwood - dry shrub	**moderate** - **high** *immature aspen, paper birch and black cottonwood*	low - **moderate** *falsebox, black huckleberry, birch-leaved spirea, prickly rose*	none	none	low - **moderate** *American vetch, yarrow, bunch-berry, Indian paintbrush*
Mixed hardwood - moist shrub	**moderate** - **high** *immature aspen, paper birch, and black cottonwood*	**moderate** - **high** *black twinberry, red-osier dogwood, thimbleberry, black gooseberry*	none	**moderate** *lady fern, cow-parsnip, baneberry, false Solomon's seal*	**moderate** - **high** *sweet-scented, bedstraw, American vetch, queen's cup, oak fern, foamflower*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Mixed hardwood - willow	**moderate** - **high** *willows, aspen, paper birch, black cottonwood*	**moderate** - **high** *black twinberry, thimbleberry, prickly rose, black huckleberry*	none	low - **moderate** *fireweed, false Solomon's-seal*	**moderate** - **high** *arctic lupine, American vetch, queen's cup, oak fern, foamflower*
Mixed shrub - dry shrub	low *willows, aspen, paper birch, black cottonwood*	**moderate** *thimbleberry, birch-leaved spirea, saskatoon, falsebox, black twinberry*	none	low *fireweed, false Solomon's-seal, showy aster*	**moderate** *queen's cup, arctic lupine, foamflower, heart-leaved arnica, twinflower*
Mixed shrub - grass	none - low *Douglas maple*	**moderate** *soopolallie, prickly rose, falsebox, tall Oregon-grape, saskatoon*	none	none	**moderate** - **high** *pinegrass, bluejoint, showy aster, creamy peavine, heart-leaved arnica*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Mixed shrub - low forb	none	low	low	none - low	low - **moderate**
		black huckleberry, falsebox, birch-leaved spirea, black gooseberry	*dwarf blueberry*	*fireweed*	*twinflower, heart-leaved arnica, one-sided wintergreen, yarrow, pinegrass*
Mixed shrub - moist forb	none - low	**moderate**	none - low	**moderate**	**moderate** - **high**
	immature hardwoods, Sitka alder	*black huckleberry, oval-leaved blueberry, black twinberry, thimbleberry*	*dwarf blueberry*	*fireweed, false Solomon's-seal, spiny wood fern*	*oak fern, rosy twistedstalk, foamflower, twinflower, queen's cup, sweet-scented bedstraw*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	Low Shrub	Dwarf Shrub	Tall Herb	Low Herb
Mixed shrub - moist shrub	none - low *mountain alder, willow*	**moderate** - **high** *black twinberry, highbush-cranberry, black gooseberry, red-osier dogwood, prickly rose*	none	low - **moderate** *lady fern, spiny wood fern, Indian hellebore, cow-parsnip, false Solomon's-seal*	low - **moderate** *trailing raspberry, common mitrewort, heart-leaved arnica, Lindley's aster, palmate coltsfoot, mountain sweet-cicely*
Mixed shrub - pink spirea	none	**moderate** - **high** *pink spirea, black twinberry, thimbleberry*	low *creeping-snowberry, dwarf blueberry*	low *lady fern, bluejoint, Indian hellebore*	**moderate** *palmate coltsfoot, great northern aster, trailing raspberry, twinflower, common mitrewort, five-leaved bramble*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Mixed shrub - rose	none - low	**moderate** - **high**	none	none	low - **moderate**
	mountain alder, willow	*prickly rose, common snowberry, black twinberry, northern black currant, red-osier dogwood*			*Lindley's aster, twinflower, sweet-scented bedstraw, trailing raspberry, star-flowered false Solomon's-seal*
Mixed shrub - scrub birch	low	**moderate** - **high**	none - very low	none	low
	willows	*scrub birch, willows, black twinberry*			*sedges, grasses*
Mixed shrub - sphagnum	none	**moderate** - **high**	low - **moderate**	none	low - **moderate**
		Labrador tea, scrub birch, willows	*bog cranberry, creeping snowberry, bog rosemary*		*sedges, coltsfoot*

TABLE A15.1 (continued)

Vegetation	Ground Cover and Principal Species by Vegetation Stratum				
Subcomplex	Tall Shrub	Low Shrub	Dwarf Shrub	Tall Herb	Low Herb
Mixed shrub - tall fern	low	**moderate**	none - very low	**high**	**moderate** - **high**
	mountain alder, tall willows, or Sitka alder in subalpine	*thimbleberry, black twinberry, red elderberry, Douglas maple*		*lady fern, spiny wood fern, false Solomon's-seal, baneberry*	*foamflower, trailing raspberry, bunchberry*
Mixed shrub - tall shrub	**moderate** - **high**	low - **moderate**	none - very low	none - very low	low
	water birch	*black gooseberry, black twinberry, north. gooseberry*			*northwestern sedge, bastard toad-flax, western meadowrue*
Mixed shrub - wet forb	low - **moderate**	**moderate**	none	low	**moderate** - **high**
	mountain alder, willow	*black twinberry, willows, red-osier dogwood, prickly rose*			*horsetails, common sedge, soft-leaved sedge, nodding wood-reed, fringed aster, star-flowered false Solomon's-seal*

TABLE A15.1 (continued)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	**Low Shrub**	**Dwarf Shrub**	**Tall Herb**	**Low Herb**
Pinegrass - bunchgrass	low	low	low	none	**moderate** - **high**
	Rocky Mountain juniper	*saskatoon, common snowberry, prickly rose*	*kinnikinnick*		*bluebunch wheatgrass, pinegrass, junegrass*
Pinegrass - kinnikinnick	none - very low	low	**moderate**	none	low - **moderate**:
	occasionally few scattered Sitka alder	*prickly rose, soopolallie*	*large patches of kinnikinnick*		*pinegrass, bunchberry, spike-like goldenrod, twinflower, fireweed*
Pinegrass - low forb	none	low - **moderate**	low - **moderate**	none	**moderate** - **high**
		prickly rose, soopolallie, birch-leaved spirea, saskatoon	*kinnikinnick, dwarf blueberry*		*pinegrass, showy aster, wild strawberry, twinflower, heart-leaved arnica*

TABLE A15.1 (concluded)

Vegetation Subcomplex	Ground Cover and Principal Species by Vegetation Stratum				
	Tall Shrub	Low Shrub	Dwarf Shrub	Tall Herb	Low Herb
Subalpine herb	none	low	none	**moderate**	**moderate** - **high**
		black twinberry, white-flowered rhododendron, black huckleberry, black gooseberry		*lady fern, Sitka valerian, Indian hellebore, cow-parsnip, arrow-leaved groundsel*	*mountain hairgrass, rosy twistedstalk, foamflower, globeflower, oak fern*
Fireweed - low forb	none	low	none	**moderate**	**moderate**
		black huckleberry, falsebox		*fireweed*	*bunchberry, five-leaved bramble, queen's cup, one-sided wintergreen*
Fireweed - moist forb	none	low	none	**high**	**high**
		black huckleberry, oval-leaved blueberry, thimbleberry, black twinberry, alder		*fireweed, false Solomon's-seal, lady fern*	*foamflower, one-sided wintergreen, oak fern, rosy twistedstalk, heart-leaved arnica*

Reference

Newton, M. and P.G. Comeau. 1990. Control of competing vegetation. *In* regenerating British Columbia's forests. D.P. Lavender, R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). Univ. B.C. Press, Vancouver, B.C. Chap. 19, pp. 256-265.

Supplement to

A FIELD GUIDE TO FOREST SITE IDENTIFICATION AND INTERPRETATION FOR THE CARIBOO FOREST REGION

O. A. Steen and R. A. Coupé

Ministry of Forests
Research Program
1997

The following supplement to the original (1997) field guide is available:

- Supplement 1 (2001) - ESSFxv2 site series classification (6•12)

ESSFxv2
ENGELMANN SPRUCE–SUBALPINE FIR
VERY DRY VERY COLD SUBZONE
BIG CREEK VARIANT

The ESSFxv2 includes the highest-elevation forests on leeward slopes of the Coast Mountains and the Camelsfoot Range southeast of Taseko Lakes. It extends from Anvil Mountain in the Chilcotin Ranges eastward to the east slopes of the Camelsfoot Range, overlooking the Fraser River valley. The ESSFxv2 landscape includes low, rounded summits and relatively little-dissected, gentle to moderate slopes. Elevations are primarily 1650–2100 m.

Distinguishing Adjacent Units from the ESSFxv2

The **ESSFxv1** occurs at similar elevations west of the ESSFxv2 on the eastern Chilcotin Ranges and the Pacific Ranges. The **MSxv** occurs below the ESSFxv2 throughout most of its range except on the east slopes of the Camelsfoot Range where the **MSxk** occurs below the ESSFxv2. The **AT** Zone occurs above the ESSFxv2.

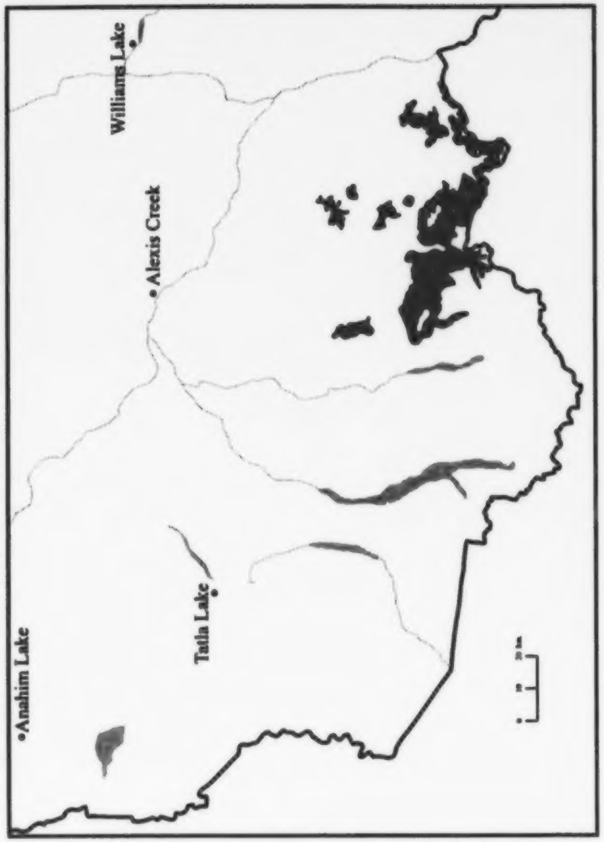
In the **ESSFxv1**, zonal sites have:
- frequently abundant subalpine fir;
- more common grouseberry and soopolallie;
- less common northwestern sedge, wild strawberry, and arctic lupine.

In the **MSxv**, zonal sites have:
- little or no subalpine fir, whitebark pine, mountain sagewort, arctic lupine, or white-flowered rhododendron;
- more abundant red-stemmed feathermoss and bunchberry;
- frequent pinegrass and prickly rose.

wet sites have:
- little or no Sitka valerian, Indian hellebore, or pink mountain-heather.

In the **MSxk**, zonal sites have:
- more abundant red-stemmed feathermoss and bunchberry;
- frequent pinegrass and prickly rose;
- little or no subalpine fir, mountain sagewort, whitebark pine, white-flowered rhododendron, Sitka valerian, Indian hellebore, or pink mountain-heather.

Distribution of ESSFxv2 Variant in the Cariboo Forest Region



In the AT, zonal sites have:

- predominantly non-forest vegetation (alpine tundra);
- trees, if present, seldom more than 10 m tall.

Site Units of the ESSFxv2

Zonal site series **01 Bl - Arnica - Cladonia Site Series** is common on well-drained, mid and upper slope positions. Mature forests on these sites are dominated by lodgepole pine and occasionally Engelmann spruce and have a sparse understory of subalpine fir and Engelmann spruce. The undergrowth includes a moderate to high cover of herbaceous species and relatively few shrubs. Common juniper is the only shrub species that is nearly always present. Black huckleberry frequently occurs with low stature and cover. Predominant herb species include arctic lupine, grouseberry, twinflower, bracted lousewort, northwestern sedge, and heart-leaved arnica. The bryophyte/lichen layer covers a low to moderate proportion of the surface. Principal genera are cladonia lichens, pelt lichens, *Dicranum*, and *Brachythecium*.

Drier sites Sites drier than zonal sites occur on hill crests, steep south- and west-facing slopes, and coarse soils. They are moderately common. Compared to zonal or other mesic sites these sites have a greater diversity and cover of grasses and lichens. Steep, warm aspects often have species such as nodding onion, saskatoon, and pinegrass that are most common at lower elevations.

02 BlPa - Juniper - Cladonia Site Series occurs on ridge tops and other crest slope positions with near-surface (<50 cm) bedrock. Soils typically contain large amounts of coarse fragments. The mature forest canopy is moderately open and dominated by lodgepole pine. The understory consists of a low to moderate density of subalpine fir and lesser lodgepole pine. Undergrowth vegetation cover is sparse and typically includes scattered common juniper, a few low herbs, and abundant lichens, particularly cladonia and pelt lichens.

03 BlPa - Kinnikinnick Site Series occurs on moderate to steep south and southwest aspects. Exposed mineral soil and bedrock are common on many sites. The mature forest canopy of these sites is very open (usually <15% cover) and consists primarily of lodgepole pine and whitebark pine. Small trembling aspen stems are present on many sites. The shrub layer is notably poor in shub species richness and consists primarily of an abundant cover of common juniper and soopolallie. Although the herb layer is moderately diverse, herbaceous cover consists primarily of few species (especially kinnikinnick, northern and spike-like goldenrods, and grasses).

04 BlPa - Juniper - Kinnikinnick Site Series occurs primarily on moderately to steeply sloping warm aspects with submesic moisture regime. It also occupies some gentle slopes on all aspects near the southern limits of the ESSFxv2. The mature forest canopy is closed and dominated by lodgepole pine or rarely by subalpine fir. Tree regeneration layers include low to moderate densities of lodgepole pine, subalpine fir, and occasionally whitebark pine. Few shrubs species occur in the undergrowth and total shrub cover, exclusive of tree regeneration, varies from 1 to 20%. The principal shrubs are prickly rose, common juniper, and soopolallie. On most sites, total cover of the herb layer is high and typically includes pussytoes, wild strawberry, dwarf blueberry, kinnikinnick, pinegrass, northwestern sedge, twinflower, and goldenrod. Lichens (mostly cladonia species and pelt lichens) typically dominate the moss/lichen layer, although red-stemmed feathermoss is occasionally abundant. The presence of prickly rose, pinegrass, and kinnikinnick distinguishes this site series from other near-mesic site series.

05 BlPa - Grouseberry Site Series generally occurs above 1800 m, on moderately to steeply sloping mid and upper slope positions on north- and east-facing slopes. The mature forest canopy is typically closed and dominated by a mixture of lodgepole pine, Engelmann spruce, and subalpine fir. Subalpine fir regeneration is often dense. Whitebark pine is occasionally present in both overstory and regeneration layers. The relatively sparse undergrowth vegetation includes low shrubs (principally common juniper) and herbaceous species (especially heart-leaved arnica, arctic lupine, bracted lousewort, and grouseberry). The presence of arctic lupine, mountain sagewort, and *Solorina crocea* and the lack of white-flowered rhododendron, crowberry, and step moss distinguishes this site series from the ESSFxv2/06, which occurs on similar sites at lower elevations in the variant.

06 Bl - Rhododendron - Crowberry Site Series occurs on mid and upper slope positions of moderate to steep, north- and east-facing slopes. In contrast to the ESSFxv2/05, elevations are predominantly below 1800 m. The mature forest canopy is closed and dominated by lodgepole pine or subalpine fir and frequently includes whitebark pine and Engelmann spruce. The undergrowth vegetation includes a well-developed shrub layer distinguished by abundant white-flowered rhododendron and frequent black huckleberry. Grouseberry, crowberry, and heart-leaved arnica dominate the herb layer. The moss/lichen layer is most commonly dominated by high cover of feathermosses. The high cover of white-flowered rhododendron distinguishes this site series from similar sites in the ESSFxv2.

Wetter sites. Sites wetter than zonal sites generally have abundant spruce and subalpine fir in the forest canopy. Sites moistened by intermittent or persistent, low-volume seepage water have low amounts of black twinberry, western meadowrue, and glow moss. Wetter sites frequently have, in addition to these species, scrub birch, willows, Sitka burnet, common horsetail, glow moss, sphagnum mosses, and sickle mosses. Wet sites most often occur on toe and depression slope positions, which accumulate cold air.

07 Bl - Lousewort - Glow moss Site Series occurs on gentle to moderately sloping mid, lower, and toe slope positions where soils are moistened by intermittent or persistent seepage. It is most common on north- or east-facing slopes. The mature forest canopy is moderately closed and dominated by a mixture of Engelmann spruce, subalpine fir, and lodgepole pine. A well-developed cover of low to moderate-height herbaceous species and a nearly complete cover of mosses form the undergrowth. Principal forbs include heart-leaved arnica, one-sided wintergreen, arctic lupine, and bracted lousewort. Moss cover is nearly complete and includes moist- and wet-site species such as glow moss and *Drepanocladus* species.

08 Bl - Horsetail - Glow moss Site Series occurs on lower and toe slope positions and in small depressions with a near-surface water table. Soils are gleyed or strongly mottled. The mature forest canopy is relatively open and dominated by lodgepole pine and Engelmann spruce. Shrub cover is sparse and includes scattered willows, common juniper, and black twinberry. These sites are distinguished from other wet sites by a high cover of common horsetail. Other herbs characteristic of these wet sites include bluejoint, pink wintergreen, arrow-leaved groundsel, western meadowrue, globeflower, and dwarf scouring-rush. The moss/lichen layer is typically dominated by wet-site species, including *Drepanocladus* species, glow moss, sphagnum moss, and golden fuzzy fen moss.

09 Se - Trapper's tea - Glow moss Site Series occupies lower slopes and slight depressions where persistent, slow-moving subsurface seepage water is common. The water table remains near the soil surface throughout the growing season. The surface of the site is hummocky. The mature forest canopy is relatively open and dominated by Engelmann spruce with scattered subalpine fir. Trees establish primarily on raised microsites. Trapper's tea is abundant and forms the dominant cover in the shrub layer. Herb cover is relatively sparse and consists of species characteristic of mesic sites, such as bunchberry and twinflower, on the tops of hummocks and species of wetter sites, such as horstail, coltsfoot, and cow parsnip, in microdepressions. The moss layer is nearly continuous and dominated by glow moss and sphagnum moss.

10 Se - Willow - Glow moss Site Series occurs on lower and toe slope positions with a near-surface water table or abundant near-surface seepage water. These sites frequently occur in cold air drainage tracks. The mature forest canopy is open and most commonly dominated by Engelmann spruce but occasionally by lodgepole pine. Scattered subalpine fir and Engelmann spruce occur in the understory, primarily on raised microsites. These sites are distinguished from the ESSFxv2/07 by a well-developed shrub layer dominated by willows and scrub birch. Wet-site forbs dominate the moderately well-developed herb layer and include common horsetail, dwarf scouring rush, western meadowrue, arrow-leaved groundsel, sedges, and coltsfoot. The moss/lichen layer covers most of the surface and consists primarily of wet-site species, including glow moss, golden fuzzy fen moss, and leafy mosses.

Non-forested Sites The natural landscape of the ESSFxv2 is mostly forested but wetlands, shrub-carrs, and meadows are locally common, especially in the upper Big Creek and Dash Creek areas. Sedge fens and shrub fens are common wetland types. Meadows and grasslands occur in high-elevation valley bottoms where cold air limits forest establishment. These valley-bottom communities often include alpine plant species. Grasslands and shrub steppe communities also occur on steep south aspects and ridge tops. These are typically dominated by common juniper and kinnikinnick together with several species of grasses and forbs.

Key to Site Units of the ESSFxv2

1a. Soils shallow (<50 cm), bedrock outcrops usually present; moisture regime xeric to subxeric.

  2a. Slope position predominantly crest; slope gradient <25%; aspect variable; kinnikinnick, pussytoes, and spotted saxifrage absent or incidental.

ESSFxv2/02 BlPa - Juniper - Cladonia

  2b. Slope position upper or mid; slope gradient >25% and aspect S or SW; kinnikinnick abundant (>15% cover), pussytoes and spotted saxifrage present.

ESSFxv2/03 BlPa - Kinnikinnick

1b. Soils deeper, bedrock outcrops usually absent; slope position not crest (except on low, rounded hills); moisture regime subxeric or wetter.

  3a. Slope gradient >25%.

    4a. Slope aspect SE, S, SW, or W; kinnikinnick and pussytoes usually present.

      5a. Moisture regime predominantly subxeric (occasionally xeric); slope aspect S or SW; sites sparsely-forested; kinnikinnick abundant (>15% cover), pinegrass usually absent.

ESSFxv2/03 BlPa - Kinnikinnick

      5b. Moisture regime predominantly submesic; slope aspect SE, S, SW, or W; forest canopy typically closed; kinnikinnick not abundant (<15% cover), pinegrass present.

ESSFxv2/04 BlPa - Juniper - Kinnikinnick

4b. Slope aspect NW, N, NE or E; pussytoes and kinnikinnick absent or incidental.

6a. White-flowered rhododendron cover abundant (generally > 15% cover), crowberry and black huckleberry usually present; elevations generally below 1800 m.
ESSFxv2/06 Bl - Rhododendron - Crowberry

6b. White-flowered rhododendron cover not abundant (generally < 2% cover); crowberry and black huckleberry usually absent or incidental; elevations generally above 1800 m.
ESSFxv2/05 BlPa - Grouseberry

3b. Slope gradient <25%.

7a. Moisture regime subxeric, submesic, or mesic; slope position mostly upper or mid; no evidence of persistent seepage or water table within 1 m of soil surface; black twinberry, pink wintergreen, arrow-leaved groundsel, globeflower, common horsetail, glow moss, and *Drepanocladus* mosses absent or incidental.

8a. Moisture regime predominantly submesic; pinegrass, pussytoes, and kinnikinnick usually present; slope aspect SE, S, SW, or W.
ESSFxv2/04 BlPa - Juniper - Kinnikinnick

8b. Moisture regime mesic or submesic; pinegrass, pussytoes, and kinnikinnick absent or incidental; slope aspect various.
ESSFxv2/01 Bl - Arnica - Cladonia

7b. Moisture regime subhygric to subhydric; slope position lower, toe, or depression (occasionally mid in /08); evidence of seepage water or water table within 1 m of surface; black twinberry, pink wintergreen, arrow-leaved groundsel, globeflower, common horsetail, glow moss, or *Drepanocladus* mosses present.

9a. Moisture regime predominantly subhygric; water table or persistent seepage water not present within 50 cm of surface; slope position lower or mid; scrub birch, willows, and common horsetail not abundant (<5% cover).
ESSFxv2/07 Bl - Lousewort - Glow moss

9b. Moisture regime predominantly hygric or subhydric; water table or persistent seepage water usually present within 50 cm of surface; slope position toe or depression; scrub birch, willows, or common horsetail abundant (>10% cover).

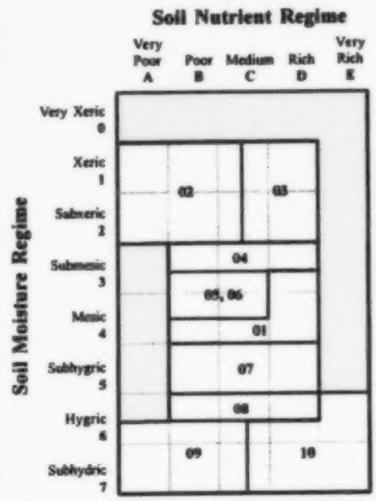
10a. Common horsetail very abundant (>40% cover), scrub birch, willows, and trapper's tea absent or incidental (<1% cover).
ESSFxv1/08 Bl - Horsetail - Glow moss

10b. Common horsetail not abundant (usually <10% cover, rarely to 25% cover); scrub birch, willows, trapper's tea present and commonly abundant.

11a. Combined cover of scrub birch and willows >10%; trapper's tea absent or incidental.
ESSFxv1/10 Se - Willow - Glow moss

11b. Combined cover of scrub birch and willows <10% (mostly <3%); trapper's tea abundant (>10% cover).
ESSFxv1/09 Se - Trapper's tea - Glow moss

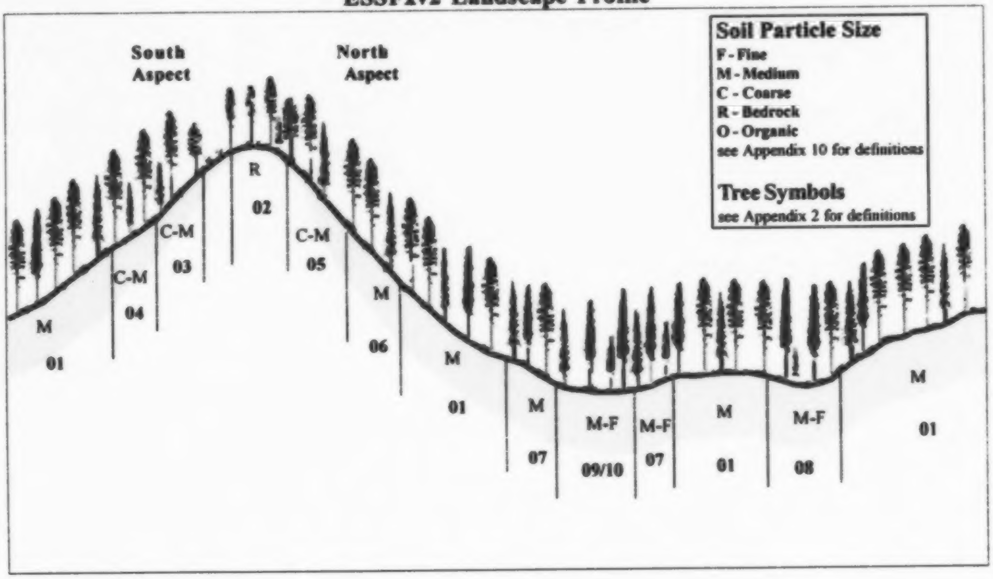
ESSFxv2 Edatopic Grid


Soil Nutrient Regime
Very Poor A
Poor B
Medium C
Rich D
Very Rich E
Soil Moisture Regime
Very Xeric 0
Xeric 1
Subxeric 2
Submesic 3
Mesic 4
Subhygric 5
Hygric 6
Subhydric 7
02
03
04
05, 06
01
07
08
09
10

Site Series

01	Bl - Arnica - Cladonia
02	BlPa - Juniper - Cladonia
03	BlP - Kinnikinnick
04	BlPa - Juniper - Kinnikinnick
05	BlPa - Grouseberry
06	Bl - Rhododendron - Crowberry
07	Bl - Lousewort - Glow moss
08	Bl - Horsetail - Glow moss
09	Se - Trapper's tea - Glow moss
10	Se - Willow - Glow moss

ESSFxv2 Landscape Profile


South Aspect
North Aspect
M 01
C-M 04
C-M 03
R 02
C-M 05
M 06
M 01
M 07
M-F 09/10
M-F 07
M 01
M-F 08
M 01
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions

Site Features of ESSFxv2 Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to moderately sloping sites with mesic or near-mesic moisture regime	dry crests and some upper slopes with shallow soils (< 50 cm) over bedrock	moderate to steep S and SW-facing slopes; forest canopy very open, transitional to grassland	moderately to steeply sloping mid and upper slopes, predominantly on warm aspects	steep NW-, N-, NE,- and E-facing slopes generally above 1800 m and with coarse soils
Soil Moisture / Nutrient Regimes	mesic, submesic / poor - rich	xeric, subxeric / very poor, medium	xeric, subxeric / medium, rich	submesic (mesic) / poor - rich	submesic, mesic / poor, medium
Slope Position	mid, upper (lower, level)	crest, upper	upper	mid, upper	upper, mid
Aspect	all	all	S, SW	variable, but mostly SE, S, SW, W	NW, N, NE, E
Slope Grade (%)	0 - 15; except 15 - 35 on NW, N, NE, and E aspects	variable	25 - 70	15 - 45	>35
Soil Texture	loamy	gravelly loamy, sand	gravelly loamy, sand	gravelly loamy, sand	rubbly and gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 2 - 3	Hemimor 2 - 3	Hemimor, Rhizomull 1 - 2	Hemimor, Mormoder (Rhizomull) 1 - 3	Hemimor 2 - 5
Occurrence / Size / Distribution	common / medium, large / wide	uncommon / small / wide	common / small, medium / wide	common / medium / wide	common / medium, large / predominantly above 1800m

Site Features of ESSFxv2 Site Series (continued)

Site Series	06	07	08	09	10
Key Features	moderately to steeply sloping cool aspects on mid to upper slopes, mostly below 1800 m	moist seepage sites on mid and lower slopes	wet lower and toe slopes and depressions with near-surface water table or seepage	wet lower and toe slopes and depressions with near-surface water table	wet lower slopes and shallow depressions with near-surface water table
Soil Moisture / Nutrient Regimes	submesic, mesic / poor, medium	subhygric / poor - rich	hygric / poor - rich	hygric, subhydric / medium - very rich	hygric, subhydric / poor, medium
Slope Position	mid, upper	lower, mid	lower, toe, depression	lower, toe, depression (mid)	lower, depression
Aspect	NW, N, NE, E	all	n/a	all (predominantly NW, N, NE, E)	all
Slope Grade %	>25	<25	0 - 20	0 - 15	0 - 5
Soil Texture	gravelly loamy	loamy	silty, loamy	silty, loamy	loamy
Humus Form and Thickness (cm)	Hemimor, Mormoder 3 - 8	Hydromor, Hydromull, Hemimor 2 - 10	Hydromoder, Hemimor 5 - 30	Hydromor, Hydromull 12 - 20	Hydromor 15 - 25
Occurrence / Size / Distribution	common / small, medium / wide	common / small, medium / wide	uncommon / small / unknown	common / small, medium / wide	very uncommon / small / unknown

ESSFxv2 Vegetation Table*

	Site Unit	02	03	04	05	06	01	07	08	09	10	
Tree Layer	*Pinus contorta* var. *latifolia*	5	3	5	5	5	5	1	1		1	lodgepole pine
	Picea engelmannii		1		4	3	1	5	1	4	4	Engelmann spruce
	Abies lasiocarpa				1	3						subalpine fir
Shrub Layer	*Abies lasiocarpa*	1		1	4	3	3	4	1	2	2	subalpine fir
	Juniperus communis	3	4	3	2	1	3	1	2	2	1	common juniper
	Shepherdia canadensis	1	3	1								soopolallie
	Vaccinium membranaceum	1	1			3	1					black huckleberry
	Rhododendron albiflorum					5						white-flowered rhododendron
	Ledum glandulosum									5		trapper's tea
	Salix spp.						1	1	1	2	5	willows
	Betula nana								1		2	scrub birch
Herb Layer	*Empetrum nigrum*	1	1			3	1	1		3	1	crowberry
	Solidago multiradiata	1	2	3								northern goldenrod
	Antennaria spp.		2	3								pussytoes
	Arctostaphylos uva-ursi		5	3								kinnikinnick
	Calamagrostis rubescens			3								pinegrass
	Phyllodoce empetriformis				3			1				pink mountain-heather
	Vaccinium scoparium				4	3	1		1	3		grouseberry
	Pedicularis bracteosa				3		3	3	1	2	2	bracted lousewort
	Equisetum arvense								5	4	4	common horsetail
	Pyrola asarifolia								4		1	pink wintergreen
	Calamagrostis canadensis								3		1	bluejoint
	Senecio triangularis								3	2	2	arrow-leaved groundsel
	Trollius albiflorus								2	2	2	globeflower
	Carex media								1		2	Scandinavian sedge
	Equisetum scirpoides								2		2	dwarf scouring-rush
Moss Layer	*Cladonia* spp.	4	3	4	3	3		2			1	cladonia lichens
	Dicranum spp.	1	1	1	4	3	3	4				heron's-bill mosses
	Peltigera spp.	3	2	3	3	1	3	3	1			pelt lichens
	Stereocaulon spp.	3	1	1			1					coral lichens
	Tortula spp.	1	1				1					sidewalk mosses
	Barbilophozia spp.	1			4	1						leafy liverworts
	Brachythecium spp.				3			1	3			ragged mosses
	Pleurozium schreberi				1	4	1	1				red-stemmed feathermoss
	Hylocomium splendens					3	1		1	4		step moss
	Aulacomnium palustre							5	5	5	5	glow moss
	Drepanocladus spp.							4	1		1	sickle mosses
	Mnium spp.								1	3	2	leafy mosses
	Tomentypnum nitens								1	3	3	golden fuzzy fen moss
	Sphagnum spp.									5	1	peat mosses

*Species abundance: 1 present in 40–60% of plots surveyed; 2 >60% of plots, mean cover <1%; 3 >60% of plots, mean cover 1–7%; 4 >60% of plots, mean cover >7–15%; 5 >60% of plots, mean cover >15%

Supplement to

A FIELD GUIDE TO FOREST SITE IDENTIFICATION AND INTERPRETATION FOR THE CARIBOO FOREST REGION

O. A. Steen and R. A. Coupé

Ministry of Forests
Research Program
1997

The following supplements to the original (1997) field guide are available:

- Supplement 1 (2001) - ESSFxv2 site series classification (6•12)
- Supplement 2 (2002) - SBSmw site series expanded classification (6•40)

SBSmw
SUB-BOREAL SPRUCE
MOIST WARM SUBZONE

The SBSmw is in the northeast portion of the Cariboo Forest Region and adjacent portions of the Prince George Forest Region. In the Cariboo Forest Region (1374 km^2), it extends eastward from the Quesnel River across the gently rolling landscapes of the Fraser Plateau to the western edge of the Quesnel Highland. It also occurs along the east side of the Fraser River north of the confluence of the Fraser and Cottonwood rivers. Elevations range from about 700 to 1000 m.

Distinguishing Adjacent Units from the SBSmw

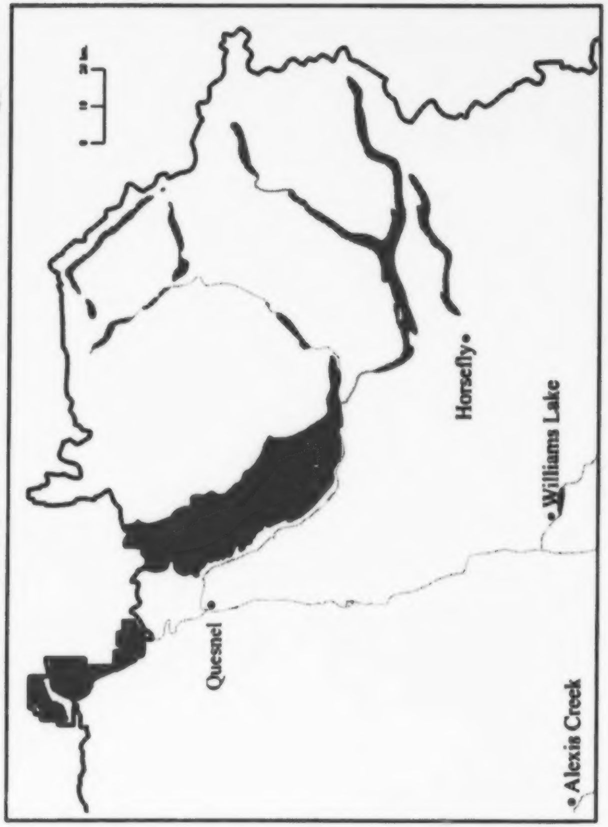
The **SBSwk1** occurs at higher elevations along most of the eastern boundary of the SBSmw where precipitation is greater and temperatures are cooler. The **SBSmh** occurs along the western boundary of the SBSmw in the Quesnel and Fraser river valleys where mean annual temperatures are warmer. A small area of the **SBSdw1** borders the SBSmw near Ten Mile Lake, north of Quesnel. The **ICHmk3** shares a short border with the SBSmw, south of Quesnel Forks, and the **ICHwk2** borders a very small section of the SBSmw boundary near the west end of Quesnel Lake.

In the **SBSwk1**, zonal sites have:
- abundant oak fern, three-leaved foamflower, and five-leaved bramble;
- little or no Douglas-fir.

In the **SBSmh**, zonal sites have:
- beaked hazelnut;
- common Douglas maple and red-osier dogwood;
- little or no foamflower, rosy twistedstalk, lodgepole pine, queen's cup, or black huckleberry.

In the **SBSdw1**, zonal sites have:
- pinegrass or blue wildrye;
- no rosy twistedstalk or one-leaved foamflower.

In the **ICHmk3**, zonal sites have:
- western redcedar and five-leaved bramble;
- no western mountain-ash, showy aster, or trailing raspberry.



Distribution of SBSmw Subzone in the Cariboo Forest Region

In the **ICHwk2**, zonal sites have:
- western redcedar and western hemlock;
- common oak fern, three-leaved foamflower, and five-leaved bramble.

Site Units of the SBSmw

Zonal Site Series **01 SxwFd - Falsebox Site Series** is the predominant site unit of the SBSmw on gentle to moderately steep, lower to upper slope positions and level sites with medium-textured soils. The climax forest canopy is dominated by hybrid white spruce and subalpine fir, although Douglas-fir is common as a long-lived seral species. Due to past fires, seral lodgepole pine and Douglas-fir stands are common. In all stands, subalpine fir is the most abundant species of tree regeneration. The undergrowth vegetation has a moderate cover of low shrubs, especially black huckleberry, falsebox, and thimbleberry. The herbaceous layer has few grasses but a moderate cover of forbs, including bunchberry, twinflower, queen's cup, wild sarsaparilla, and heart-leaved arnica. Moss cover is nearly continuous and dominated by red-stemmed feathermoss, knight's plume, step moss, and electrified cat's-tail moss.

Drier Sites Sites drier than the zonal site series are moderately common, occurring on ridge tops, shallow soils, sandy soils, and steep south-facing slopes. Lichens and juniper haircap moss are more abundant than on mesic sites, but moist site species such as black twinberry, foamflower, star-flowered Solomon's-seal, and trailing raspberry are uncommon.

02 FdBl - Huckleberry Site Series occurs on upper slopes and ridge tops where soils are very shallow (<20 cm) over bedrock. Sites are mostly small, and the vegetation is distinguished by abundant lichens and *Dicranum* mosses. The mature forest canopy is typically dominated by short Douglas-fir and lodgepole pine. Low shrubs, especially black huckleberry, are abundant. Several herbaceous species are present but none is abundant, and total herb cover is sparse to moderate. Mosses, principally red-stemmed feathermoss, wavy-leaved moss, and juniper haircap moss, cover about 50% of the surface.

03 Pl - Huckleberry - Velvet-leaved blueberry Site Series is common on level to gently sloping, dry sandy soils, usually glaciofluvial terraces and outwash. Soil gravel contents are usually very high. The mature forest canopy is typically dominated by lodgepole pine with an understory of subalpine fir and hybrid white spruce. In areas of cold air accumulation, black spruce is occasional. The undergrowth vegetation is distinguished by the presence of velvet-leaved blueberry, which, together with black huckleberry, bunchberry, and twinflower, typically dominates the undergrowth. In contrast to the /02 site series, feathermosses are abundant, and cladonia and cladina lichens cover only a very small portion of the surface.

04 SxwFd - Knight's plume Site Series occurs on moderate to steep (>30%) south- and west-facing upper slopes. Soils are medium-textured but have a high gravel content. This site series is also present on broad ridge tops and gentler upper slopes where soils are shallow (<50 cm) to bedrock, but deeper and more continuous than in the /02 site series. The mature forest canopy is typically dominated by Douglas-fir and occasionally by lodgepole pine. Tree regeneration is typically dense and predominantly subalpine fir. The undergrowth vegetation has a sparse to moderate cover of low shrubs (especially falsebox, saskatoon, and black huckleberry), and a sparse cover of herbaceous species. Mosses, especially red-stemmed feathermoss and knight's plume, typically cover 50% or more of the surface. The vegetation is distinguished from other dry sites by abundant mosses, few or no cladonia and cladina lichens, and little or no velvet-leaved blueberry.

Wetter Sites Sites wetter than the /01 site series are common on lower slopes, valley-bottom flats, and riparian areas, and in small depressions. The vegetation is distinguished from /01 and drier sites by black gooseberry, lady fern, oak fern, bluejoint, and pink spirea.

05 Sxw - Pink spirea Site Series is common in the Sundberg Lake and Umiti Creek areas on moist lower slopes, shallow depressions and poorly drained flats where cold air accumulates, primarily adjacent to wetlands and in low-relief basins. Summer frost is frequent, and soils are relatively cold. The mature forest canopy is dominated by lodgepole pine or occasionally by hybrid white spruce. Tree regeneration is generally sparse. The undergrowth vegetation is distinguished by its vigorous shrub layer dominated by pink spirea, willows, and black twinberry. Labrador tea is also frequently present. Common herbs and dwarf shrubs include bluejoint, creeping-snowberry, palmate coltsfoot, and twinflower. Moss cover is nearly continuous and often includes sphagnum mosses.

06 Sxw - Oak fern Site Series is common on lower and toe slope positions where soils are moistened by intermittent, low-volume seepage water from upslope areas. The mature forest canopy is typically dominated by hybrid white spruce, lodgepole pine, and subalpine fir, and the understory layers by relatively dense subalpine fir regeneration. Low shrubs are moderately abundant; principal species are black huckleberry, black twinberry, and black gooseberry. The herbaceous layer includes abundant oak fern, which, together with the low abundance of black twinberry and devil's club, distinguishes the vegetation from other site series.

07 Sxw - Twinberry - Oak fern Site Series occurs on moist lower and toe slope positions, primarily along stream channels. Persistent seepage water or a water table is usually evident within 50–100 cm of the surface, and sites are mostly in cold air accumulation areas. The mature forest canopy is dominated by widely spaced hybrid white spruce trees over a subcanopy of subalpine fir. The shrub layer is usually dense and dominated by black twinberry and thimbleberry. Abundant black twinberry distinguishes these sites. The herbaceous layer includes many low and medium-sized forbs with moderate cover. Oak fern and lady fern are usually abundant.

08 Sxw - Devil's club Site Series is common on lower and toe slope positions where soils are moistened by persistent seepage. Subsoils are usually strongly mottled and often gleyed. In contrast to the /07 unit, the /08 unit does not occur on sites with substantial cold air accumulations. The mature forest canopy is dominated by a mixture of hybrid white spruce and subalpine fir. The undergrowth is dominated by and distinguished by abundant devil's club and ferns, including lady fern, spiny wood fern, and oak fern.

09 Sxw - Horsetail Site Series occurs on gentle toe slopes and in depressions with a persistent near-surface (<50 cm) water table. Soils are typically Organics or Gleysols with thick surface organic horizons. The mature forest canopy is predominantly widely spaced hybrid white spruce with a small component of subalpine fir. Trees are often rooted on raised microsites. The undergrowth is distinguished by an abundant (>5%) cover of horsetail species. Several other wet-site species, such as mountain alder, lady fern, great northern aster, soft-leaved sedge, and leafy mosses, are also common.

10 SbSxw - Scrub birch - Sedge Site Series occurs in wet depressions where a water table is near the surface (<50 cm). These are primarily forested wetlands that have organic soils. The mature forest canopy is relatively open and dominated by black spruce and often includes lesser amounts of hybrid white spruce and lodgepole pine. The undergrowth is distinguished by a significant (>5%) cover of sphagnum moss, as well as other typical bog species, including scrub birch, Labrador tea, bog willow, bog cranberry, and a variety of sedges.

Since initially publishing this field guide in 1997, the site series classification of the SBSmw has been revised to include previously unclassified site series. These include additional ecosystems occurring in the Sundberg Lake and Umiti Creek areas that are very prone to growing-season frosts. Also added to the classification are very wet, sparsely treed sites with nutrient-rich soils.

11 Pl - Huckleberry - Knight's plume Site Series occurs primarily on the low-relief terrain in the Sundberg Lake and Umiti Creek areas. This site series is similar to the /01 site series except that these sites are very prone to growing-season frosts. The site series occurs most commonly on level to gently sloping sites with mesic or near-mesic moisture regimes. Soils are predominantly medium-textured and are occasionally compacted at depth. The mature forest canopy is dominated by lodgepole pine with scattered hybrid white spruce and subalpine fir. Tree regeneration is predominantly hybrid white spruce and subalpine fir. The undergrowth vegetation has a moderate cover of low shrubs, especially black huckleberry, prickly rose, and birch-leaved spirea. On some sites, soopolallie forms the dominant shrub cover. Common herbs and dwarf shrubs include bunchberry, twinflower, dwarf blueberry, and stiff clubmoss. Pinegrass is occasionally present with low cover. Moss cover is nearly continuous and dominated by red-stemmed feathermoss and knight's plume. These sites are differentiated from the /01 site series by their lack of Douglas-fir, thimbleberry, queen's cup, and and prince's pine.

12 Sxw - Pink spirea - Sphagnum Site Series occurs on wet lower and toe slope positions in low-relief topography. A water table remains near the surface throughout the growing season. Vegetation on these sites is strongly influenced by cold air accumulation and cold soils.

The mature forest canopy is dominated by lodgepole pine and hybrid white spruce. The undergrowth is distinguished by a high cover of pink spirea, low to moderate cover of Labrador tea and creeping snowberry, and the presence of sphagnum moss and common haircap moss.

13 Sxw - Mountain alder - Lady fern Site Series occurs on gentle toe slopes and in depressions with free water commonly present at the soil surface. Soils are typically Gleysols with moderately thick, well decomposed surface organic horizons. The mature forest canopy is predominantly widely spaced hybrid white spruce and subalpine fir, commonly on raised microsites. The undergrowth is distinguished by an abundant cover of mountain alder and other wet-site shrubs, including devil's club, black twinberry, thimbleberry, and red elderberry. Lady fern, oak fern, and cow parsnip are usually abundant. The moss layer is generally poorly developed and consists primarily of leafy mosses.

Non-forested Sites Wetlands are common in depressions in gently rolling terrain and along low-gradient streams. Fens are the predominant wetland type, although bogs and swamps are also present.

KEY TO SITE UNITS OF THE SBSmw

1a. Soils <50 cm deep over bedrock and no evidence of seepage water; usually crest or upper slope position; bedrock outcrops often present.

  2a. Soils extremely shallow, mostly <20 cm to bedrock; moisture regime very xeric or xeric; combined cover of cladonia and cladina lichens >2%; bedrock usually exposed.
  SBSmw/02 FdBl - Huckleberry

  2b. Soils mostly 20–50 cm deep; moisture regime xeric or subxeric; combined cover of cladonia and cladina lichens <2%; bedrock may or may not be exposed.
  SBSmw/04 SxwFd - Knight's plume

1b. Soils deeper, or evidence of near-surface seepage water present; slope position various; bedrock outcrops seldom present.

3a. Soil texture sand or loamy sand and no persistent seepage water or water table within 100 cm of surface; mostly level or gently sloping fluvial or glaciofluvial parent materials.

4a. Velvet-leaved blueberry common (5–50% ground cover) and oak fern absent or incidental; slope position generally level or mid and moisture regime submesic.

SBSmw/03 Pl - Huckleberry - Velvet-leaved blueberry

4b. Velvet-leaved blueberry absent or incidental and oak fern cover >10%; slope position generally lower, and moisture regime mesic to subhygric.

SBSmw/06 Sxw - Oak fern

3b. Soils not sandy or, if so, then persistent seepage or water table within 100 cm of surface; slope position various.

5a. Slope gradient 30% or greater **and** slope aspect SE, S, SW, or W.

SBSmw/04 SxwFd - Knight's plume

5b. Slope gradient <30% or, if steeper, then aspect NW, N, NE, or E.

6a. Moisture regime submesic, mesic, or subhygric; no persistent seepage or water table within 50 cm of surface.

7a. Oak fern cover >10%; moisture regime mesic or subhygric.

SBSmw/06 Sxw - Oak fern

7b. Oak fern cover <10%; moisture regime predominantly submesic or mesic.

8a. Douglas-fir, sarsaparilla, rattlesnake-plantain, and tall Oregon grape usually present; creeping snowberry and five-leaved bramble absent or incidental.

SBSmw/01 SxwFd - Falsebox

8b. Douglas-fir, sarsaparilla, rattlesnake-plantain, and tall Oregon grape absent or incidental; creeping snowberry and five-leaved bramble usually present (sites most commonly associated with large cold air accumulation basins).

SBSmw/11 Pl - Huckleberry - Knight's plume

6b. Moisture regime subhygric or wetter; evidence of seepage water inputs or water table within 50 cm of surface.

9a. Moisture regime subhygric; no water table within 50 cm of surface; slope position lower or toe.

10a. Pink spirea cover ≥5%; oak fern absent or incidental; predominantly in cold air accumulation basins.

SBSmw/05 Sxw - Pink spirea

10b. Pink spirea cover <5%; oak fern usually abundant; site variable but not in cold air accumulation basin (/07 often occurring in valley-bottom cold air accumulation sites).

11a. Devil's club cover ≥5% in mature forest; cover of black twinberry and thimbleberry each <5%; lower and toe slope positions without significant cold air accumulation.

SBSmw/08 Sxw - Devil's club

11b. Devil's club cover <5%; black twinberry or thimbleberry cover >5%; predominantly toe slope positions along stream channels; cold air accumulation sites.

SBSmw/07 Sxw - Twinberry - Oak fern

9b. Moisture regime hygric or wetter; persistent water table within 50 cm of soil surface; slope position lower, toe, or depression.

12a. Labrador tea, creeping snowberry, and sphagnum moss present; devil's club, clasping twistedstalk, large-leaved avens, and ragged mosses absent or incidental.

13a. Surface organic layers ≥50 cm over mineral soil; mature forest canopy dominated by black spruce.
SBSmw/10 SbSxw - Scrub birch - Sedge

13b. Surface organic layers <50 cm (mostly <20 cm) over mineral soil; mature forest canopy dominated by hybrid white spruce or lodgepole pine.
SBSmw/12 Sxw - Pink spirea - Sphagnum

12b. Labrador tea, creeping snowberry, and sphagnum moss absent or incidental; devil's club, clasping twistedstalk, large-leaved avens, or ragged mosses present.

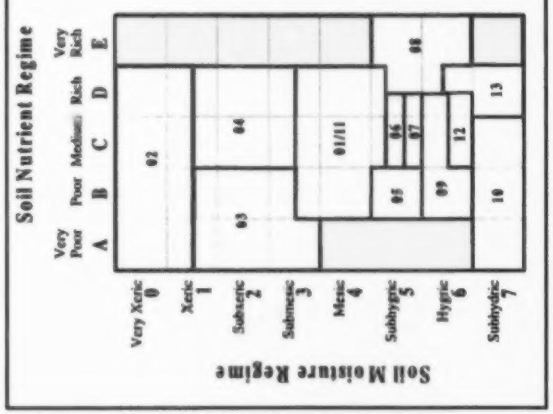
14a. Feathermosses common (at least on raised microsites); sweet-scented bedstraw present; mountain alder <5% cover.

15b. Devil's club cover ≥5% and horsetail cover <3%.
SBSmw/08 Sxw - Devil's club

15a. Devil's club <5% cover and horsetail cover ≥10%.
SBSmw/09 Sxw - Horsetail

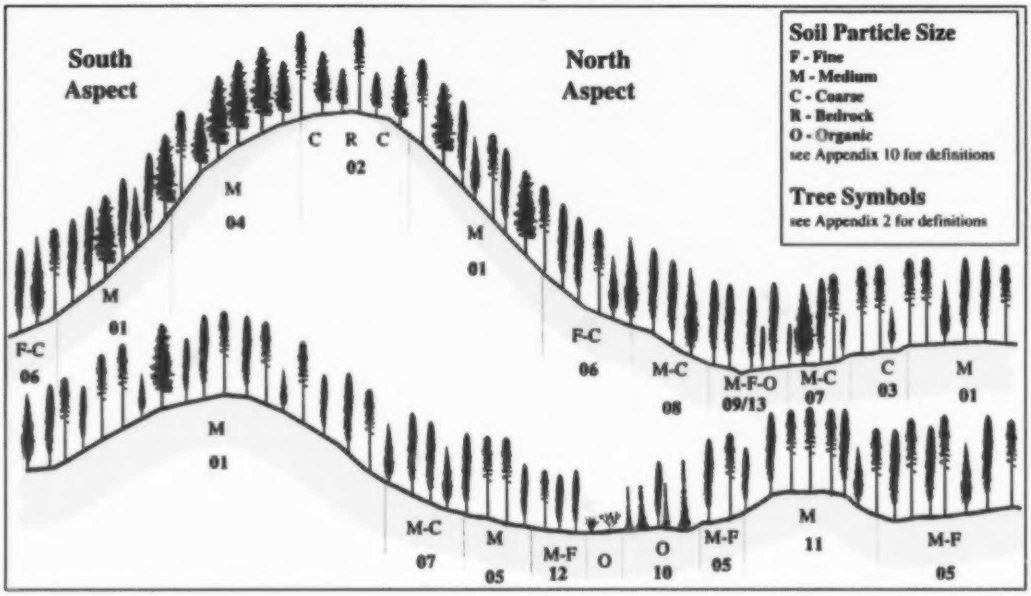
14b. Feathermosses and sweet-scented bedstraw absent or incidental and mountain alder abundant (>15% cover).
SBSmw/13 Sxw - Mountain alder - Lady fern

SBSmw Edatopic Grid


Soil Nutrient Regime
Very Poor
A
Poor
B
Medium
C
Rich
D
Very Rich
E
Soil Moisture Regime
Very Xeric
0
Xeric
1
Subxeric
2
Submesic
3
Mesic
4
Subhygric
5
Hygric
6
Subhydric
7
02
03
04
01/11
05
06
07
08
09
12
10
13

Site Series	
01	SxwFd – Falsebox
02	FdBl – Huckleberry
03	Pl – Huckleberry – Velvet-leaved blueberry
04	SxwFd – Knight's plume
05	Sxw – Pink spirea
06	Sxw – Oak fern
07	Sxw – Twinberry – Oak fern
08	Sxw – Devil's club
09	Sxw – Horsetail
10	SbSxw – Scrub birch – Sedge
11	Pl – Huckleberry – Knight's plume
12	Sxw – Pink spirea - Sphagnum
13	Sxw – Mountain alder – Lady fern

SBSmw Landscape Profile


South Aspect
North Aspect
Soil Particle Size
F - Fine
M - Medium
C - Coarse
R - Bedrock
O - Organic
see Appendix 10 for definitions
Tree Symbols
see Appendix 2 for definitions
F-C 06
M 01
M 04
C R C 02
M 01
F-C 06
M-C 08
M-F-O 09/13
M-C 07
C 03
M 01
M 01
M-C 07
M 05
M-F 12
O
O 10
M-F 05
M 11
M-F 05

Site Features of SBSmw Site Series

Site Series	01	02	03	04	05
Key Features	zonal and other gently to steeply sloping sites with mesic or near mesic moisture regime.	dry crests and upper slopes with very thin (< 20 cm) soils over bedrock; bedrock usually exposed	gently sloping and level sites with dry sandy soils; no evidence of seepage input or water table.	predominantly steep upper slopes; also gentle upper slopes or crests with shallow (21 - 50 cm) soils on NW to E aspects	moist sites in cold air accumulation basins, intermittent seepage or water table below 50 cm; often adjacent to wetlands
Soil Moisture / Nutrient Regimes	mesic, (submesic - subhygric) / poor - rich	very xeric, xeric / very poor - rich	xeric - submesic / very poor, poor	xeric - submesic / medium, rich	subhygric / poor
Slope Position	mid (upper - lower)	crest	level	crest, upper	toe, lower, level
Aspect	all	all	N/A	all	all
Slope Grade (%)	0 - 30 (70)	0 - 30	0 - 10	0 - 70	< 10
Soil Texture	gravelly loamy, sand, silty,	gravelly loamy, sand	sand, gravelly sand	gravelly loamy	loamy, gravelly loamy
Humus Form and Thickness (cm)	Hemimor, Hemihumimor 3 - 8	Xeromor 1 - 3	Hemimor 2 - 5	Xeromor, Hemimor 2 - 8	Hemihumimor, Hydromor 6 - 16
Occurrence / Size / Distribution	predominant / large / wide	uncommon / small / wide	common / medium / wide	uncommon / small / wide	locally common / small - large / Sundberg Lake and Umiti Creek areas

Site Features of SBSmw Site Series (continued)

Site Series	06	07	08	09	10
Key Features	moist lower and toe slope positions with intermittent seepage; also on some moist level areas with silty or clayey soils	moist lower and toe slope positions with seepage or water table below 50 cm; often in valley bottoms and along streams where cold air accumulates	moist lower slope positions with significant seepage inputs and better cold air drainage than /07; moist, rich, very productive sites	wet, level to gently sloping sites with near-surface (< 50 cm) water table and less than 50 cm of organic material over mineral soil	wet, level to gently sloping sites with near-surface (< 50 cm) water table and 50 cm or more of organic materials over mineral soil
Soil Moisture / Nutrient Regimes	subhygric / medium, rich	subhygric / medium, rich	subhygric / rich, very rich	hygric / poor - rich	subhydric / poor, medium
Slope Position	lower, level	lower, toe (middle)	lower, toe	toe, depression	depression
Aspect	all	all	all but predominantly north	all	N/A
Slope Grade (%)	0 - 20	0 - 20 (40)	5 - 50 (70)	0 - 5	0 - 5
Soil Texture	gravelly sand, loamy, silty, clayey	gravelly sand, loamy, silty	gravelly loamy, sand	loamy, silty	organic
Humus Form and Thickness (cm)	Hemimor, 3 - 12	Hemihumimor, Hydromoder 5 - 13	Hemihumimor, Hydromor 6 - 15	Hydromoder, Histomoder 5 - 50	Organic soils
Occurrence / Size / Distribution	common / medium / wide	common / medium / wide	common / medium - large / wide	uncommon / small - medium / wide	common / small / wide

Site Features of SBSmw Site Series (continued)

Site Series	11	12	13
Key Features	mesic and near-mesic sites in large, cold air basins	wet, level to gently sloping sites with near-surface (< 50 cm) water table in areas of significant cold air accumulation	wet, nutrient-rich, lower and toe slope sites with near surface (< 5 0 cm) water table; commonly adjacent to streams
Soil Moisture / Nutrient Regimes	mesic, (submesic, subhygric) / poor - rich	hygric / medium, rich	hygric, subhydric / rich
Slope Position	mid, lower and level	lower, toe	lower, toe
Aspect	all (commonly SE, S, Sw, W)	all	N/A
Slope Grade (%)	< 15	0 - 10	0 - 5
Soil Texture	loamy, sandy	loamy, silty	loamy (sandy)
Humus Form and Thickness (cm)	Hemimor, Mormoder 4 - 10	Hydromor 5 - 16	Mormoder, Mullmoder, Vermimull 6 - 15 (30)
Occurrence / Size / Distribution	uncommon / small - medium / observed only in Maude Lake and Umiti Creek areas	uncommon / small - medium / observed only in Maude Lake and Umiti Creek areas	uncommon / small / wide

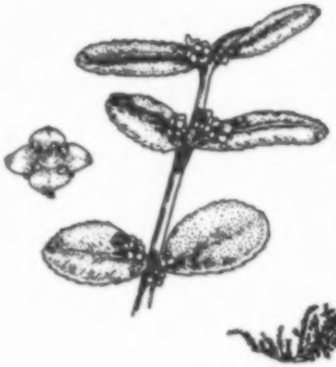
SBSmw Vegetation Table[a]

	Site Unit	02	03	04	01	11	05	06	07	08	09	13	12	10	
Tree Layer	*Pseudotsuga menziesii*	▮▮▮▮▮		▮▮▮▮▮	▮▮▮▮▮										Douglas-fir
	Pinus contorta	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮	▮▮▮▮	▮▮▮▮▮	▮					▮▮▮▮▮	▮▮▮	lodgepole pine
	Abies lasiocarpa	▮▮▮	▮▮▮	▮	▮▮▮			▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	▮			subalpine fir
	Picea engelmannii x glauca	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮		▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮		hybrid white spruce
	Picea mariana													▮▮▮▮	black spruce
Shrub Layer	*Vaccinium myrtilloides*		▮▮▮▮▮										▮▮		velvet-leaved blueberry
	Amelanchier alnifolia	▮▮▮	▮▮▮	▮▮	▮▮		▮▮▮	▮			▮		▮		saskatoon
	Pachistima myrsinites	▮▮▮		▮▮▮	▮▮▮	▮▮									falsebox
	Vaccinium membranaceum	▮▮▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮		▮▮▮							black huckleberry
	Rubus parviflorus		▮		▮▮▮			▮▮▮	▮▮▮▮▮	▮▮▮		▮▮▮▮	▮		thimbleberry
	Acer glabrum			▮	▮										Douglas maple
	Lonicera involucrata				▮▮	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮	black twinberry
	Alnus tenuifolia						▮▮▮		▮	▮	▮▮▮▮	▮▮▮▮▮	▮	▮	mountain alder
	Spiraea douglasii						▮▮▮▮				▮		▮▮▮▮▮	▮	pink spirea
	Oplopanax horridus				▮					▮▮▮▮▮	▮▮▮	▮▮▮▮			devil's club
	Betula glandulosa												▮	▮▮▮▮	scrub birch
	Ledum groenlandicum												▮▮▮	▮▮▮▮▮	Labrador tea
Herb Layer	*Carex rossii*	▮▮													Ross' sedge
	Chimaphila umbellata	▮▮	▮▮▮	▮▮	▮▮										prince's pine
	Goodyera oblongifolia	▮▮	▮▮	▮▮	▮▮										rattlesnake-plantain
	Clintonia uniflora		▮▮▮		▮▮▮			▮▮▮	▮▮	▮					queen's cup
	Arnica cordifolia				▮▮▮	▮▮			▮						heart-leaved arnica
	Smilacina stellata							▮	▮▮	▮▮	▮				star-flowered false Solomon's-seal
	Mitella nuda				▮▮			▮▮▮	▮	▮	▮▮▮	▮		▮▮	common mitrewort
	Streptopus roseus				▮	▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮	▮	▮	▮			rosy twistedstalk
	Gaultheria hispidula						▮▮						▮▮▮	▮▮▮	creeping snowberry
	Gymnocarpium dryopteris				▮			▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮	▮		oak fern
	Circaea alpina								▮	▮▮▮	▮▮▮	▮▮			enchanter's nightshade
	Heracleum lanatum								▮▮			▮▮▮			cow parsnip
	Equisetum spp.							▮	▮▮	▮▮	▮▮▮▮	▮▮▮	▮	▮▮▮	horsetails
	Carex disperma						▮▮▮				▮▮▮		▮	▮▮▮	soft-leaved sedge
	Carex aquatilis													▮▮▮▮	water sedge

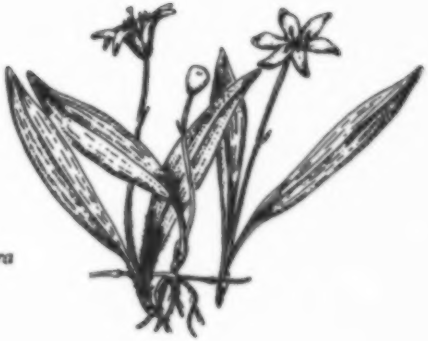
SBSmw Vegetation Table[a] (continued)

	Site Unit	02	03	04	01	11	05	06	07	08	09	13	12	10	
Moss Layer	*Cladina* spp.	▮▮▮	▮	▮											reindeer lichens
	Cladonia spp.	▮▮▮		▮											cladonia lichens
	Dicranum spp.	▮▮▮▮		▮											heron's-bill mosses
	Polytrichum juniperinum	▮▮▮		▮											juniper haircap moss
	Peltigera aphthosa	▮▮▮	▮▮▮	▮▮	▮▮			▮▮	▮	▮▮					freckle pelt
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮▮▮		▮▮▮	▮▮▮	red-stemmed feathermoss
	Peltigera spp.	▮▮▮		▮▮			▮▮			▮					pelt lichens
	Ptilium crista-castrensis		▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮▮	▮▮▮▮	▮▮▮▮	▮		▮▮▮▮	▮	knight's plume
	Hylocomium splendens		▮▮▮▮	▮	▮▮▮▮			▮▮▮	▮	▮	▮▮▮			▮	step moss
	Rhytidiadelphus triquetrus		▮	▮	▮▮▮▮			▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮		▮		electrified cat's-tail moss
	Brachythecium spp.				▮		▮	▮	▮▮	▮▮▮	▮▮▮▮	▮▮▮			ragged mosses
	Mnium spp.				▮		▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮		leafy mosses
	Sphagnum spp.						▮▮▮▮				▮		▮▮▮▮▮	▮▮▮▮▮	sphagnums
	Tomenthypnum nitens													▮▮▮	golden fuzzy fen moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%



Falsebox
Pachistima myrsinites



Queen's cup
Clintonia uniflora